ELECTRICAL REVIEW

ILLUSTRATED.

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VIEWS, NEWS AND INTERVIEWS.

"Had there been no subway agitation or legislation, last week's storm would not have crippled overhead wires as much as it did," remarked General C. H. Barney, an old-time telephone man. "In view of all the circumstances, overhead construction in New York is not up to that high standard which it would approach were the companies assured that their poles and wires would not be cut down and carted off on short notice. Overhead lines have been kept in working order, but no more; they may be ordered into subways any day."

As electrical securities become better known they will gain in favor with the investing public. Knowledge must precede faith.

John W. Mackay and C. W. Bonynge had a rough-and-tumble fight in the president's office of the Nevada Bank in San Francisco. Mackay was the aggressor and victor, while Bonynge had his feelings and his eye hurt. Social rivalry between the families of the two men is assigned as the cause of the ungentlemanly episode. Bonynge was in New York last Fall endeavoring to organize a cable company which was to compete especially with the Mackay-Bennett cables. He is a big man, physically, and pronounces his name "Bunning."

They say that a new discovery in the way of incandescent lights reduces the cost of some material $310 a pound.—*Plainfield, N. J., News.*

"They say" that if you look in an alligator's off eye, the Gulf Stream will make jerked beef go up in price.

Just as much sense in the second paragraph as in the first.

When a certain New York livery-stable keeper goes out with his brush and pot of vermilion paint to decorate the island, he has a habit of calling up his office over the telephone to ask if the stable is still there and making money. Before his clerk can ask where his employer is he has rung off and flitted away, only to call up the stable again in a few minutes from a point many blocks away from his first post. Last week his wife chased him in a cab from telephone to telephone for three days, and then gave the case to the police. Before the blue-coats got down to business the livery-stable man walked calmly into his office, examined the books, and then went home. History doth not record the domestic drama which followed. His friends say, "He has a great head for business—great head!"

Levi Beebe, a Massachusetts weather prophet, says the worst storm of the season will come upon us during the first half of February. Beebe is said to have predicted the great blizzard four months before it occurred. If Levi would only foretell some way to forestall this coming storm his fortune would be forthcoming.

An underground railroad has been proposed for Boston. It is similar to Mr. Austin Corbin's proposed tunnel road for New York. It will connect the various railroad stations of the Hub.

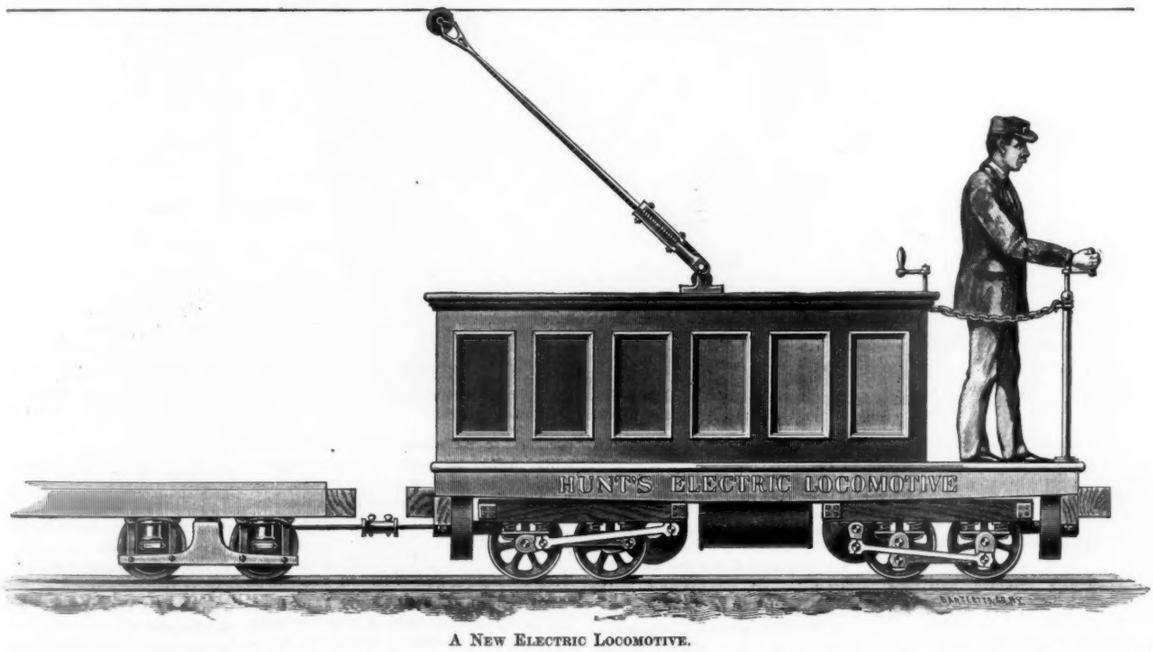
Said the superintendent of an electric signal company: "I notice in going about among American manufacturers that the majority of them are pretty well posted on electrical matters, and are eager to learn more. They take deep interest in electrical devices and apparatus of all kinds, and are ever ready to be talked to about any new electrical appliance which will likely be of service to them."

Hunt's Electric Locomotive.

Coal handling machinery, industrial railways, conveyers and ropes are some of the specialties made by the C. W. Hunt Company at their large and well-equipped shops and disposed of from their offices at 45 Broadway, New York. The industrial railways made by this company are of standard character, operated by steam or electric locomotives, and designed for use in large manufacturing plants, navy yards, mines and similar places.

The Hunt electric locomotive is the subject of the illustration presented herewith. As shown in the cut, it is operated on the single trolley overhead system.

This class of locomotives will usually take the current from the dynamos used for lighting the premises or the street lighting companies. They are well suited to the Hunt system of tracks, and in mechanical design are intended to utilize every advantage that is possible to do and to make as near an ideal machine as the electrical apparatus of the day admits. The whole weight is carried on two trucks with springs and arranged to take curves of 12 and 20 feet radii. The wheels are driven by side rods in order to dispense with all the gearing possible, and the motor placed on the platform of the car where it can be reached at once. The Edison, Thomson-Houston, or any motor in the market wound to suit any current can be used, thus making it a universal machine. The Hunt electric locomotive is built in four styles: First, locomotives weighing five to 15 tons, taking the current from overhead wires with a trolley; second, locomotives of similar capacity carrying storage batteries; third, locomotives for rack railways; fourth, flat top cars carrying the mechanism beneath the platform. The Hunt Company does not make the dynamos, motors or storage batteries, but use those of any of the standard makers to suit the lighting plant that will furnish the current.



A NEW ELECTRIC LOCOMOTIVE.

Government Shells to be Electrically Welded at Lynn.

The experiments and tests which have for 18 months been in process in the line of shell welding by the United States government, have resulted in something of a practical nature. The government has entered into an arrangement with the Thomson Electric Welding Company, of Lynn, Mass., to furnish a large quantity of their supplies, with a surety of a very large business in the future.

It is the intention of the welding company to form a special company for the sole object of making these shells. They will at once erect a factory. The plans are already prepared and the new plant will be fitted with machinery and be ready for occupancy within 60 days. It will be located in the close vicinity of the present welding works in West Lynn. Other countries are also very much interested in the shells, and are prepared to adopt their use, but the home demand will be large enough to keep the plant actively engaged for some time to come. The new factory will be 200x80 feet, with every facility for producing the shells, and in charge of men specially trained for the peculiar work. Lieut. W. M. Wood, of of the United States Navy, the inventor of the electrically-welded shell, will be actively connected with the company. The formation of the new concern will be wholly in the interests of the present stockholders of the welding company.

Mr. Bowler has a High Forehead.

The electric circuit has been completed all over the town, and only the globes remain to be placed in position, which will not be done until the last moment, as Mr. Bowler wishes to save them from the weather as long as possible, so that they will look clean and smart when the light is turned on.—*New Westminster, B. C., Columbian.*

Requirements of Electrical Engineers.

EXTRACT FROM AN ADDRESS BY PROF. SILVANUS P. THOMPSON.

It will be evident from what I have already said that amongst the most essential matters with which an electro-magnetic engineer must be conversant, are the properties of iron and the principle of the magnetic circuit. No inconsiderable part of the training of the mechanical engineer is devoted to acquiring a knowledge of the mechanical properties of materials; expensive and elaborate testing machines are devised for investigating those properties. The numerical values ascertained by such tests enter into every calculation of structures; affect every point in the design of machinery. For the electro-magnetic engineer there is, indeed, the double study not only of the magnetic properties of iron, but of the electric properties of the copper. He has to be thoroughly acquainted with the laws governing the generation and flow of electric currents; an acquaintance not to be made second-hand from books or lectures. Doubtless a complete experimental knowledge of these things may be facilitated by judicious teaching. Analogies are often helpful. No excuse is therefore needed for introducing the following table of analogies concerning the matters which are akin in several branches of engineering:

Mechanical.	Hydraulic.	Electrical.
Force	Pressure	Volts pressure
Rate of Displacement of mass (lbs. per min.)	Quantity of flow (Gals. per min.)	Amperes (cur't) (Coulombs per sec.)
Friction (coefficient of)	Fluid friction (coefficient of)	Ohms (resist'ce)
Inertia of mass	Inertia of mass	Quads (self-induction).
Elasticity	Compressibility	Farads (capa'y)

One of the most strange things about electricity, which until recent years can scarcely be said to have been comprehended, is this: That although electricity, when at rest, apparently possesses no weight, and occupies no space, yet, when it is moving along in a wire as a current, that current possesses a species of inertia. Still more strange is it that the inertia of the current apparently resides not in the copper wire within which the so-called current is flowing, but in the space outside the wire, and depends on the external medium. The inertia of an electric current flowing along in a copper wire is less if the surrounding medium is air than it is if the surrounding medium is iron. This inertia effect is, indeed, inextricably mixed up with the fact that the current sets up a magnetizing action in the medium surrounding it. Our electro-magnets are examples of spaces filled with iron, entirely exterior to the copper wire in which the electricity flows, nevertheless, being magnetized by that flow of electricity, and acting as an inertia-drag upon it.

Supposing these things, magnetic and electric, to be mastered, there remains yet one piece of practical education of the highest importance to the electro-magnetic engineer, namely, how to convey an electric current and to confine it to its proper channel. The proper jointing of electric conductors is relatively a much more important matter than the rivetting of girders, the splicing of belts, or the wiping of plumbers' joints. And the problem of properly insulating an electric conductor is much more difficult than that of preventing leakage of water, gas or steam. To make things water-tight, or steam-tight, is a comparatively simple matter. To make things properly electric-tight is by no means so easy, especially when high electric pressures are employed. To insulate an electric conductor is a fine art. The materials employed must be not only electrically non-conducting, but mechanically capable of resisting the (electric) stresses to which they are subjected. Moreover, these same stresses, acting as mechanical tensions at right angles to the surfaces of the copper conductors, combined with mechanical pressures in all directions parallel to those surfaces, are proportional, not to the electric pressure, but to the square of it. Thus, Mr. Ferranti, supplying certain districts of London by electric mains from Deptford at an electric pressure of 10,000 volts, has to provide adequate insulation capable of resisting being pierced by tensions which are 25 times as great as those that would arise if the conductors were worked at a pressure of 2,000 volts only. The insulator must mechanically resist being broken down by a spark piercing it. Adequate mechanical resistance is an absolute necessity, quite apart from any apparent value of its so-called electrical resistance. The electro-magnetic engineer must understand all about this.

But in addition to any mechanical knowledge he may possess, and besides all the practical experience he may acquire about the behavior of electric currents and changes at various pressures, he must acquire, as my discourse to-night will have shown you, a thorough knowledge of the purely magnetic branch of the subject. You cannot ignore the fact that much of this knowledge is of quite recent date; is not yet possessed by any very large number of men. There are, as yet, very few shops or factories where a young engineer can pick up a knowledge of these things. They are not like the ordinary matters of mechanical engineering, things to be learned anywhere, and known to thousands of trained men. Indeed, I think I am putting forward no unfair claim when I say that it is to the technical colleges of one description or another that the majority of young engineers must, in the present state of the industry, betake themselves if they wish to make a full acquaintance with the principles, not to say the practice, of electro-magnetic engineering. Not that there do not exist factories and shops where this branch of the great engineering industry is carried on, and where an admirable practical training is to be had; but these are relatively few, and hence entrance to them is a matter of some difficulty.

New Test Instruments.

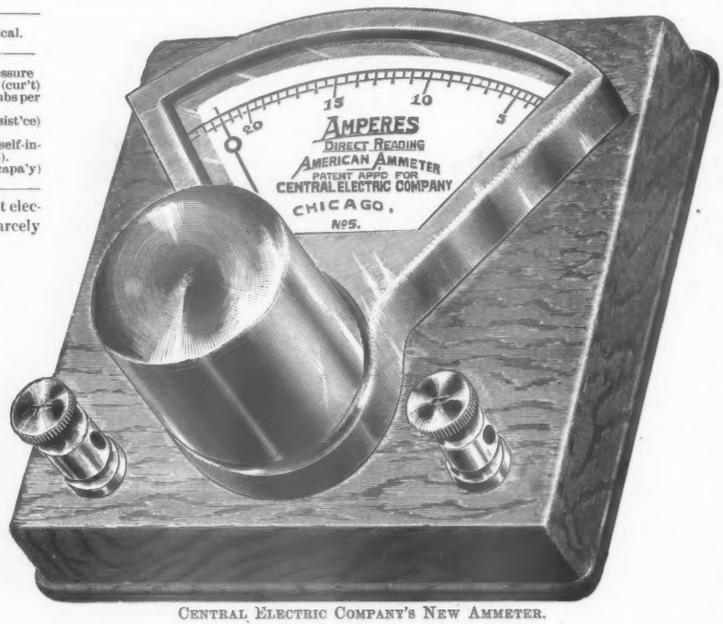
Many electrical plants are operated without the aid of suitable testing appliances on account of their great expense, and to meet this want the Central Electric Company, of Chicago, are placing upon the market new voltmeters and ammeters, which are claimed to be as accurate as the most expensive instruments in use, and, at the same time, sold for about one-third of the price.

The cut shows the form of these instruments, which are beautifully finished and are supplied in handsome hard-wood boxes. The instruments combine the qualities of convenience, accuracy and durability with simplicity. They are made on correct scientific principles, have been severely tested by scientific experts, and pronounced strictly accurate and thoroughly reliable. No permanent magnets are employed, and only the softest, chemically purified and annealed iron is used in the electro-magnets.

By an arrangement of the coil and iron, residual magnetism is reduced to a minimum, thus securing the greatest possible accuracy. The springs are of the best steel and aged, insuring permanency and reliability, and requiring no recalibration.

The pointer is pivoted on polished steel needles, is very sensitive, and when set for any point will positively stop at the same point when at rest.

The voltmeter is exactly similar in appearance to the ammeter, and the instruments would seem to be very desirable adjuncts to any electrical installation. Patents have been applied for on these instruments, which the Central Electric Company control.



CENTRAL ELECTRIC COMPANY'S NEW AMMETER.

A Cincinnati Enterprise.

Last October work was started in the erection of a new building at the corner of Court and Harrison streets, Cincinnati, to be occupied by the J. B. Morris Foundry Company, and though bad weather has delayed its construction, since that time 7,200,000 brick have been laid, and last week the formal opening was held.

The main building is four stories in height, built entirely of brick, and has a frontage of 125 feet on Harrison street. The foundry proper faces Court street with a frontage of 200 feet, and runs back a distance of 90 feet. It is covered with a slate roof supported by a strong truss frame of wood and iron, which gives for the workmen the entire space clear, without a pillar or post. The cleaning and engine rooms are adjoining, built in the most substantial manner. The cost of the building exceeded $40,000.

The company will put in the latest improved machinery, and will employ something like 250 hands. The J. B. Morris Foundry Company is the outgrowth of the Eagle Iron Foundry and Machine Works, established by Miles Greenwood in 1832.

The Electrical Slot Machine Acquitted.

A jury before Judge Andrews has given a verdict for the defendant in a suit brought by Richard C. Newkirk against the Automatic Electric Battery Company for $5,000 for injuries. The company builds and exhibits penny-in-the-slot induction coil machines. Newkirk saw one in the store at 208 Avenue A, this city, on March 24th, 1889. He says he is a dyspeptic and thinking, perhaps, electricity was good for dyspepsia, he borrowed a cent, dropped it in the slot and grabbed the handles. He says he was knocked out by the shock which followed. His right arm was treated at a hospital, and he was obliged to carry it in a sling for two months. He is a truckman, and could not attend to his business. Several experts testified on behalf of the company that Newkirk's arm could not have been disabled from the shock he received. Newkirk denied the defendant's allegation that he was drunk and hurt himself.

Residents of Harlem held a mass meeting, and sent a memorial to the New York Legislature praying for the quick passage of a rapid transit bill.

An Industry that Electricity is Killing.

The fact that the electric light has inflicted a severe blow at the occupation of the "midnight marauder," says the Brooklyn *Times*, is now a familiar one, and a recent expression of opinion on the subject of protecting houses against the depredations of housebreakers has called special attention to the means which are now available for that purpose. The task of the cracksman is becoming a weary and comparatively profitless one, and it is easy to believe that the lament which is occasionally wafted from his lips into the columns of the daily paper, that "there is now nothing in it," is uttered with the utmost sincerity. At one time it was a very easy matter for a burglar to saw through a bar or cut a pane of glass, but with the electrical appliances now being used in many houses, and which are so easily adjusted and so reliable in operation, it is only a question of time when all houses will be provided with them. The slightest movement of door or window after the alarm has been set will form a connection and start a gong in a distant part of the house. The alarm is thus given to the inmates, while the man, unconscious of the fact, is busily occupied in looking after the family silver. The same connection that alarms the sleeper may convey the alarm to the nearest police station, so that by the time the burglar gets through with his engrossing work, he may find a couple of policemen outside patiently waiting his pleasure. Not long ago an enthusiastic merchant in Paris was so delighted with the working of this form of burglar alarm that he became enamored of thief-catching as a sport. He cleverly spread stories of the hoards of jewelry and valuable bric-a-brac that were to be found in certain rooms of his house, and the bait was an irresistable one for the master cracksmen of the city. The merchant bagged his game very neatly several times, but at last the story crept out and his unique sporting career came to a sudden end. Screen doors as well as windows can be provided with the alarm fittings, so that the least attempt to make a hole will close the circuit and let the inmates of the house know of the advent of their uninvited visitor.

Rapid Transit Commission.

Another 100 interested gentlemen were present at the second hearing of the commission in Steinway Hall, January 22d. Austin Corbin's tunnel scheme was presented without argument.

Oliver W. Barnes, for the New York Underground Railway Company, said that his Company was the successor of the New York City Central Underground Railway Company, which was incorporated in 1868. The route which his company advocates lies partly under public streets and partly under private property. He believed the southern terminus should be City Hall Park.

Judge William J. Choate, representing the New York City Railway Company, said that that Corporation was organized in March, 1888, and it would begin work at once if the commission approved its route. Thomas C. Clark, the engineer, said he would construct the road in three tunnels. In the center he would run the express trains on two tracks. The local tracks he would put in smaller tunnels, one on each side. Express train stations should be one mile apart, and he would arrange so that a passenger might make a part of his journey upon an express train and the remainder upon a local train, if it would assist him in reaching his destination. The three tunnels would require a combined width of roadway of 50 feet. Local stations would require 60 feet. Combined local and express train stations would be 125 feet wide.

E. Moody Boynton appeared to advocate his bicycle railroad. He declared that it could be adapted to the existing elevated railroad systems in six months at small expense, and that trains could then be run from the Battery to Harlem in less than ten minutes. He invited the Commissioners to go down to Sea Beach and ride on his one-legged road, which has carried 8,000 trains at high speed without accident.

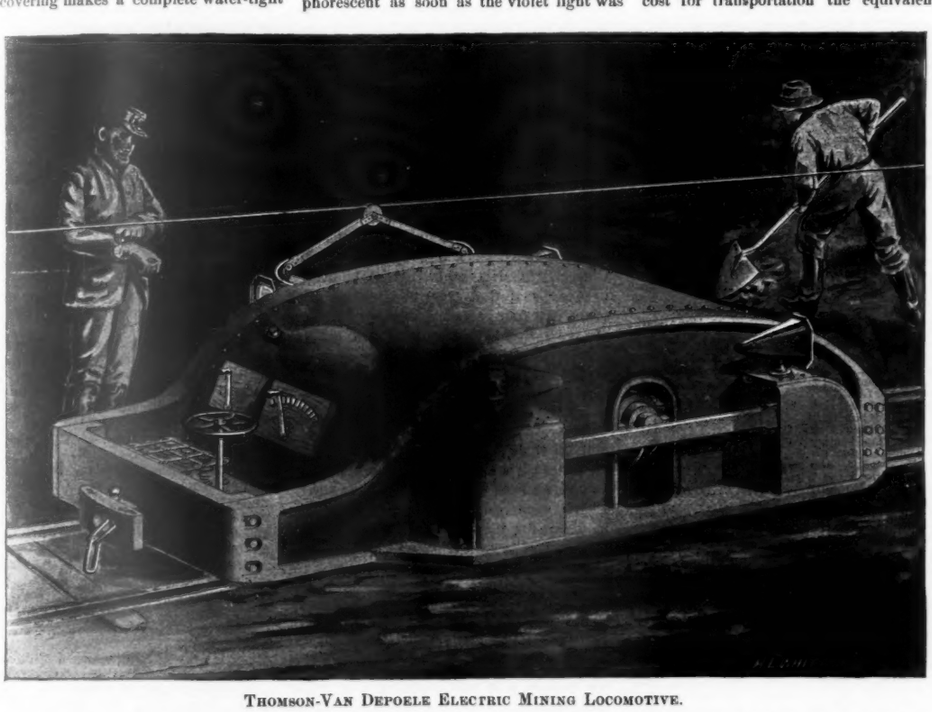
A number of other schemes, of rather an indefinite character were presented. Chairman Steinway announced that another hearing would be given at a date to be named later.

A New Mining Locomotive.

The accompanying illustration shows the new type of Thomson-Van Depoele electric mining locomotive for underground work, which the Thomson-Van Depoele Electric Mining Company, of Boston, is prepared to furnish in several sizes.

The signal success of the earlier mine haulage installations made on the Thomson-Van Depoele system has demonstrated the position which electricity is to occupy in this field of work. The machine shown is of 60 horse-power capacity, and has a total height of 39 inches from top of rails. It is built to operate on tracks of varying gauge, from 36 inches to the standard, 4 feet 8½ inches.

The controlling devices are all at one end, and the body of the locomotive being so low that the view is unobstructed in either direction, the operator need not change his position in reversing the motion of the locomotive. The electric parabolic reflectors are placed at each end, making the track clearly visible for long distances. The trolley is of the double elbow pattern found so admirably suited to mine work in previous installations. It accommodates itself to the varying heights of the trolley wire within any reasonable range. The sheet iron covering makes a complete water-tight armor, protecting the moving parts from danger of falling rocks or bodies of ore and coal. The illustration shows the locomotive in an enlarged chamber, but about to enter a tunnel whose height from top of rail is scarcely four feet; hence the depression of the trolley wire as shown.



THOMSON-VAN DEPOELE ELECTRIC MINING LOCOMOTIVE.

Phosphorescence of the Diamond.

Mr. George Frederick Kunz, in a communication to the New York *Sun*, describes some interesting discoveries he has made in reference to the phosphorescence of the diamond. An abstract of his article follows:

Experiments made with a large number of diamonds showed conclusively that all diamonds, regardless of size, origin or quality, phosphoresce in the dark. A large number were experimented with, ranging in weight from one-eighth of a carat to the two largest diamonds in the United States, weighing, respectively, 77 and 125⅝ carats. If thoroughly cleaned and dry, the diamond would phosphoresce almost at the first rub, and the result was the same whether it was drawn across a smooth board, painted or unpainted, whether pine or ebony, across the leather back of a book, a woollen cloth or a cambric handkerchief. In some, even when lightly struck against a wooden surface, the phosphorescence was apparent. The best results were obtained by drawing the stone across the grain of the wood. The intensity also varied. Diamonds which had been found to phosphoresce when taken into a dark room after exposure to the strong rays of an electric light, phosphoresced much more readily than others.

While at the Paris Exposition, in 1889, I was able (on November 4), through the courtesy of Dr. E. Marcart, member of the Institute, Director of the Central Observatory of Paris, and Prof. B. Abdank, electrician and member of the jury, to make a very beautiful experiment in connection with this quality of phosphorescence. A dark room was arranged in which a collection of over 150 diamonds was placed. In one side of the wall was inserted a lens, and outside the room was suspended a new alternating arc lamp of the Thomson-Houston system. Of the entire collection of diamonds, among which were several old Indian, Brazilian and Cape stones, and some from the South African River diggings, only three showed phosphorescence. One, a Brazilian stone of one and five-eighths carats, possessed this quality in a remarkable degree; an old Brazilian stone of three carats also showed the same property; all the others assumed a beautiful violet tint. The two stones whose phosphorescence was most marked were perfectly transparent white stones, one with a bluish tinge, but under the electric light they assumed a milky-white color like that peculiar to the Bagagom mines of Minas Geraes, of which only a few are annually found. The phosphorescence exhibited by these stones was extremely beautiful. They became phosphorescent as soon as the violet light was thrown on them after a 15 minutes' exposure, and remained so for 15 minutes after the metallic cap was put over the lens, gradually losing their intensity. All the others became invisible in the dark. Pure white light was also used, resulting in a less beautiful experiment, though the phosphorescence was apparent in the same diamonds.

This test fully demonstrated the fact that some diamonds, though not all, possess the power of absorbing light and emitting it in the dark, and in those possessing it, it is found in different degrees of intensity.

The experiments made by the writer show conclusively not only that Boyle's statement that some diamonds phosphoresce in the dark after exposure to the sunlight or an arc of electric light is true, but also that all diamonds emit light by rubbing them on wood, cloth or metal, a property which will probably prove of great value in distinguishing between the diamond and other hard stones, as well as paste, none of which exhibit this phenomenon, and will, I am sure, be welcomed by the general public who do not possess the experience of the dealer in diamonds. The property is evidently not electric, or it would not be visible on being rubbed on metal.

An Oriental Illuminating Plant.

"I understand," said the private secretary to a stockholder in the gas company, "that Arnold got $25,000 for his 'Light of Asia.'"

"You don't tell me," was the reply. "What was it; gas or electricity?"—*Washington Post.*

Electric Railroads.

[From the Boston *Herald.*]

The plan suggested by the minister of the interior of the Austro-Hungarian empire, of having an electric railway run between Vienna and Buda-Pesth, with cars leaving the two terminal stations throughout the day at intervals of ten minutes, shows the possibilities which this new system of transportation offers in the opinion of those who have made something of a study of it. The distance between the two capitals of the dual empire is more than 150 miles; but, under what is known as the "zone" method, the price of passenger transportation in Hungary has been reduced for long distances to a very low point, with, it is understood, highly satisfactory financial results. It is thought that an extensive system of intertravel can be established if this method of frequent car running is resorted to; probably for passenger service only, and with presumably a very high rate of speed. As a larger part of the railroads in both Austria and Hungary are owned by the government, there is nothing except mechanical difficulties in the way of making an experiment of this kind, which, if made, will attract interested attention all over the world. Obviously, if a line like this could be successfully maintained between the two cities referred to above at a cost for transportation the equivalent of 75 cents or a dollar, there would be no reason why a similar line could not be built and maintained between New York and Boston, for the outlay in construction as to grades, size and strength of bridges and weight of rails would make the aggregate expense very much smaller than would be required for a steam railway. At the present time it is estimated that, taking the annual average, 1,000 people leave Boston each day for New York, with the same number leaving New York for Boston. But it is probable that with the improvements referred to above, both as to time and rate of fare, the present daily average could be increased several times over.

The Greatest Feat of Reporting.

[From the Washington *Herald.*]

The greatest feat of reporting that has ever been performed by the official reporters of Congress was that of preparing the Senate report for the *Record*, Wednesday night. The chief reporter was sick, and but two men were available to do the work. The Senate was in session 14 hours, all of which time was spent in an active discussion of the Silver bill. It was after 12 o'clock at night when they adjourned, and during the session they had talked over 120,000 words. Two stenographers took the report, and, by dictating their notes into phonographs for typewriters to transcribe, they had all the copy ready for the printers by 8 o'clock in the morning, and the *Record* was on the desk of the Senators when Congress convened on Thursday.

Cleveland, O.—The Fire Alarm Electrical Company; capital, $30,000.

Chicago, Ill.—The Mercantile Telegraph Company; capital, $100,000.

Fulton, Ill.—The Fulton and East Clinton Street Railway and Power Company; capital, $20,000.

Chartiers, Pa.—Chartiers Electric Light Company; capital, $5,000. Directors, Daniel Herely, Robert McMunn, Pressley McMunn, Christopher T. Durhan and John Lee.

Akron, Ohio.—Akron Electrical Manufacturing Company; capital, $100,000. Incorporators, W. D. Chapman, F. A. Wilcox, Ed. Miller, W. B. Doyle, Jr., and W. B. Gamble.

New York City.—The Edison General Electric Company has filed in the office of the Secretary of State a certificate of an increase in its capital from $12,000,000 to $15,000,000.

Morrisonville, Ill.—The Morrisonville Electric Light Company; capital, $4,000; to furnish electric lights. Incorporators, H. C. Bohn, J. W. Campbell, E. D. Green and A. E. Cowin.

Chicago, Ill.—North American Electric Company; to manufacture motors, car tracks, etc.; capital stock, $1,000,000. Incorporators, J. H. Donnelly, Frank J. Sally and Myron H. Beach.

Chicago, Ill.—Chicago Electric Protective Company, at Chicago; capital stock, $100,000; to deal in electric supplies and operate fire and police alarm and patrols. Incorporators, Mark Simons, Walter M. Lawley, Frank S. Weigley.

Frankfort, Ind.—The Jerman Electric Company, to manufacture fire and burglar alarms, has been incorporated; capital stock, $8,000. A. L. Fisher, Joseph C. Stewart, L. B. Zaring, F. E. Garrison and L. J. Perkins, are directors.

Princeton, Ill.—Princeton Electric Light and Power Company; capital, $15,000; to furnish electric light and power, and to construct electric motor line. Incorporators, H. H. Ferris, David Knight, J. A. Stean, D. B. Loverin, D. E. Munger, H. H. Preestly.

Salem, Ind.—Salem Electric Light and Artificial Ice Company; capital, $15,000. President, E. W. Menaugh; vice-president, C. W. Mobley; secretary, Eugene Heim; treasurer, J. F. Persise; directors, A. J. Parker, L. W. Sinclair, Lewis Dennis, Chas. McClintock, C. C. Cooper, M. B. Hottel and C. C. Hanger.

Jersey City, N. J.—The Tellmic Manufacturing Company, with $50,000 capital, for the manufacture of a certain quality of tiling for underground electric conduits, has filed its certificate of payment of capital stock and election of officers. The company was formed by New York capitalists, R. O. Babbitt being the only Jersey City man mentioned in the certificate of incorporation.

New York.—The Ongley Electric Company; capital, $750,000. Incorporated under the laws of the State of New Jersey. Trustees: T. W. Robertson, Orange, N. J.; Henry H. Hall, East Orange, N. J.; Jos. T. Thompson, West Islip, L. I., N. Y.; Chas. E. Ongley, Plainfield, N. J.; George Taylor, Roselle, N. J.; Wm. W. Henshaw, Jr., of Brooklyn, N. Y.; Henning G. Taube, New Brighton, S. I., N. Y. Factory: Jersey City. Office: 1 Broadway, N.Y. Officers: T. W. Robertson, president; Jos. T. Thompson, treasurer; Wm. W. Henshaw, Jr., secretary; Charles E. Ongley, engineer in control.

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The thoughts of the electric light man now turn to Providence.

This last storm hit New York harder than the blizzard or the memorable sleet storm of January 23d, 1881.

What a great time the daily papers have had these last few days in running down overhead wires. Aren't they down enough?

Linemen and wiremen were in great demand in New York last week. Any man who could and would wear a pair of spurs, could get work for the asking.

Prof. S. P. Thompson, in his article on the requirements of electrical engineers, printed in this issue, pays a high and justly deserved compliment to technical colleges.

The rapid transit agitation in this city continues with increased vigor owing to the passage of the Stewart bill. We look for good results from this outbreak against transit inconveniences.

During the year 1890 more than one hundred and twenty new companies connected with electrical engineering were registered in England, the total capitalization being upwards of $65,000,000.

The latest news from Pittsburgh is that Mr. Westinghouse has succeeded in placing nearly if not all the new preferred stock, and that the business will go on as before. Eastern people have been large purchasers of Westinghouse stock, which is selling several points higher than last week.

The days of immense profits in electrical manufacturing are over. To one who keeps watch of the trend of the times, the fact is apparent that success in any field depends upon the volume of business, with a minimum profit on the unit of production. Probably never again will the persuasive agent be able to dispose of an electric lighting plant for $1,800, which only cost $450 delivered.

Henry M. Stanley was the distinguished guest of the New York Press Club at its annual dinner last Saturday evening. Mr. Stanley is one of the few honorary members of the Club, and in his remarks, delivered in a conversational style, expressed his belief that had the weakest member of the press of New York city been with the unfortunate "Rear Column," he would have known what to do, and would not have remained inactive. The intrepid explorer is much changed since he was known to the Club in 1886. His face has a much kinder expression, as if the severe and terrible work of the past four years had softened a manner always stern and reserved. He was quite at home among the gentlemen of the press and highly enjoyed the hearty greetings he received.

There seems to be a general consensus of opinion that the only proper solution of the rapid transit difficulty in New York city is an underground electric railroad, or rather, several such roads. An eminent capitalist in discussing the situation the other day, said: "But an underground electrical system is what we must eventually come to, and the sooner the better. Any prejudice against it at first would be gotten over much more quickly than the prejudices against the 'L' roads. I believe that in two years from now we shall have such a system." So do we, although it will probably take rather more than two years to give New York all the underground electric rapid transit she needs, notwithstanding the speed with which the tubular iron tunnels can be constructed. As for the rolling stock, there are half a dozen firms of electric traction engineers who would be glad to take a contract to supply all that could be needed in two years' time.

PROTECTORS.

Scarcely a week now passes without one or more additions being made to the already very numerous devices intended to protect telephone and telegraph instruments from damage by the foreign currents that occasionally trespass into signaling wires from circuits carrying heavy currents. There is a strong family likeness between all these so-called "protectors." A fine fusible wire, a spring with a more or less graceful curve in it, a catch of some sort, a wooden base and a couple of binding posts, and there you are. Occasionally an electro-magnet is thrown in, but by no means always.

Rearrange the combinaton, give the spring a slightly different shape, or replace the fusible wire by a fusible something else, and christen it by your own and any other name, and you have invented an important improvement which gives you the right to buttonhole every telephone man in the country for an hour or two while you explain the merits of your protector, and strive to extract an order for a large or small quantity at a price calculated to give a modest profit of about 2,000 per cent.

It should surely be apparent to the originators, or perhaps it would be more strictly correct to call them the compilers of these interesting little instruments, that they are working on the wrong track, at all events as far as telephone work is concerned (and the telephone appears to be their principal quarry). A telephone line needs to be protected against three possible sources of danger; and, instead of a jumping-jack arrangement that only serves to open or ground the circuit when a strong current enters the line, what is needed is a system of protection to provide against any and all of the risks at which we have hinted. Too many would-be inventors start out to invent something for a particular application without studying the real requirements of the case. A little systematic investigation of the field before applying to the patent office, would often save many an inventor vexatious disappointments and loss of time.

THE LEAGUE OF PRESS CLUBS.

In Pittsburgh, last week, an International League of Press Clubs was organized. Delegates representing a press club membership of over 3,000 were present. The proceedings were full of snap and interest, the "literary fellers" running the convention in a manner that did them great credit. The average State legislature with its politicians and parliamentarians could have learned much from the business-like and parliamentary way the sessions were conducted. As a result of the deliberations, a plan of an International Association was perfected, which may comprise in its membership the press clubs of the world wherever the local membership equals 25 active members. The objects of this league are stated in the constitution to be—

To bring into close and friendly relations the press clubs of the world, and promote a more fraternal and helpful feeling among their members.

Members of clubs in the League are expected to receive full courtesies from clubs in other cities and particular recognition is asked for newspaper men while on duty.

Mr. Foster Coates, managing editor of the *Mail and Express*, of New York, was unanimously elected the presiding officer of the convention, and accepted the honor in a brilliant, brief speech in which he paid an earnest tribute to the literary work of women, stating that women's press clubs had been invited and were represented in the convention. Mayor Gourley, of Pittsburgh, welcomed the visitors, and Mr. William Berri, proprietor of the Brooklyn *Standard-Union* and chairman of the New York delegation, delivered a fitting response. San Francisco was selected as the place of next meeting, and officers for the ensuing year were elected as follows:

President—Thos. J. Keenan, Jr., Pittsburgh, Pa.

Vice-presidents—Lynn R. Meekins, Baltimore, Md.; John Anderson Boyd, Montreal, Canada; Dr. Joseph H. Senner, of the National Association of German Press Clubs; Mrs. Helen Ekin Starrett, Chicago, representing the Women's Press Clubs of America.

Secretary and Treasurer—Charles W. Price, New York.

Executive Committee—William R. Worrall, New York; M. H. De Young, San Francisco, Cal.; W. B. Weston, Grand Rapids, Mich.; H. D. Vought, Buffalo, N. Y.; Dr. John Friederich, New York; S. G. Lapham, Syracuse, N. Y.; Thos. F. Anderson, Boston, Mass.; William Berri, Brooklyn, N. Y.; Gen. I. R. Sherwood, Canton, Ohio.

The visitors were treated in most royal manner by the Press Club of Pittsburgh, and will long remember the kindly and hospitable manner in which every possible courtesy was shown them. A banquet at the Hotel Duquesne was enjoyed Thursday evening, some 250 visitors and citizens participating. Good service, eloquence and wit made the occasion a very happy one.

The New York and Boston delegations made easy connection from the banquet to the 3:20 A.M. train Friday, and found awaiting them a special car placed at their disposal by Mr. Geo. W. Boyd, the assistant general passenger agent of the Pennsylvania Company, who was a genial addition to the party as far as Philadelphia.

The New York Press Club should be proud of its delegation and the honors it received. Messrs. Coates, Berri and Hennessy deserve special mention for their intelligent work—in fact, all the members from New York worked together harmoniously for the best interests of the club and the proposed League.

The ELECTRICAL REVIEW wishes this new organization of press workers a well-rounded success, and believes that it can be made to wield a potent and highly important international influence, when once its advantages and possibilities are realized by the many press clubs of the world.

CORRESPONDENCE.

OUR WASHINGTON LETTER.

Curator of the Department of Transportation and Engineering is the unpretentious title of Prof. J. E. Watkins, of the National Museum. His work covers a field of vast importance and as broad as the world. It begins with the day on which Adam moved his household goods out of the Garden of Eden, and will end when the wheels of time stop turning. From that historic period in which "modern improvements" were unknown, the Professor will follow the wheel-tracks along roads travelled by pre-Adamic peoples and, perhaps, reach the beginning of things ahead of the Ethnologists and other adventurous investigators. At what point in the dim distance of antiquity he will find evidence of the use of electric motors, multiplex telegraphs, or far-speaking telephones, is matter for conjecture. Perhaps from some hidden tomb of unknown monarch or ruined temple of lost arts and sciences he may bring forth tiny accumulators of undreamt power, fraught with energy conserved through countless ages, to illuminate the dark by-ways through which philosophers are groping in these closing days of the nineteenth century.

The **Object** of all this research and labor is to place before the greatest number of people, in the clearest and most comprehensive manner, the simple and accurate history of the origin and development of the various arts and industries belonging to the department. For this purpose such apparatus, models, appliances, etc., as mark important epochs in the history of invention and in the development of the arts, are being placed on exhibition as fast as they can be procured. In every instance the authenticity of the article to be exhibited is first positively established. In the cabinets of the museum stand many eloquently silent machines, stamped with the names of the makers and the date on which they were first used, and the stories they tell keep the truth plainly before passing generations and give due credit to their rightful inventors.

Morse's First Telegraph Register, Page's electric motor and Reis' telephone stand at the head of their respective classes. A model of the plough with which Morse started the subway business also has a place in the telegraph case.

The **Telephone Case** is noticeable for the excellent collection that is *not in it*. Not a sign of the miracle-working machine which startled Sir William Thomson at the centennial; none of Bell's early instruments; no box telephones; no carbon transmitters; not even one of Charles Williams' coffee-grinder magneto-bells; and as for a telephone exchange, visitors to the museum would never know that such an establishment exists. The divisions of electric lighting, electric power, etc., are scarcely in any better condition.

The **Completion of These Collections** depends largely upon the persons who have relics in their possession, or who have information of their existence, and who are disposed to aid Professor Watkins in securing them before it is too late. The marvellous rapidity in the development of things electrical is leaving a track of destruction which threatens to blot out all record of much valuable work, and to efface the memory of many ingenious and worthy inventors. Unless some timely steps are taken to preserve the facts, it will soon be easier to determine who were the architects and engineers of the Pyramids, or the Tower of Babel, and by what methods their work was accomplished, than to ascertain who invented the telephone or who built the first electric railroad.

The **Museum,** acting conjointly with the American Historical Society, which has its depository in the same building, is also making a collection of books, papers, manuscript documents, etc., relating to the work of early inventors. The Historical Society is the custodian of all such papers and has every facility for their safe preservation and convenient examination by interested persons. The family of Alfred Vail have recently decided to deposit with this society the large and valuable collection of papers and drawings relating to his work in connection with the Morse telegraph, the first railroad locomotive, and other inventions with which he was identified. The importance of this decision will be better understood when it is known that, for many years, these papers have been stored in an out-of-the-way place, inaccessible to any one who might wish to examine them and liable to destruction at any moment. A systematic inquiry is being made for other manuscript papers relating to the Morse telegraph, and there is good prospect that future writers who set out to prove who really made this contribution to the world's most useful inventions will find much new material ready for their consideration.

The Co-operation of the Various Electrical Associations and Clubs, and of all persons interested, would greatly aid in making the electrical section of the museum one of its most important features, and in giving to this country the credit to which it is entitled for the part it has taken in the development of these industries. The unfortunate destruction of the records and relics collected by the Old-Time Telegraph Society, in the Western Union fire, suggests the propriety of depositing in this place the collection now being gathered. Suitable articles can be placed in the museum as a temporary loan; on deposit subject to withdrawal at at any time; or they may be presented to the institution for permanent exhibition. The director has offered the use of the large lecture hall for a temporary loan exhibition of inventions during the patent celebration, in the second week of April, and an interesting collection is expected. G. C. M.

Washington, D.C., Jan. 31st.

OUR CHICAGO LETTER.

Wm. H. McKinlock, president of the Central Electric Company, met with a very painful accident a few days ago, which confined him to his room for several days. In running for a train he stumbled and was thrown headlong into the street, severely spraining his ankle. Mr. McKinlock has so far recovered as to resume his duties, though he still "favors" that ankle.

World's Fair Committee.—The architects of the World's Fair requested the Chicago Electric Club a few days ago to appoint a committee to assist in designing the buildings and arranging space for the electrical exhibits. In response to this call the following committee of 15 gentlemen was appointed: B. E. Sunny, chairman; J. P. Barrett, Alex. Kempt, F. E. Degenhardt, C. A. Brown, W. J. Chalmers, C. H. Wilson, F. W. Cushing, F. S. Terry, M. A. Knapp, F. B. Ball, W. A. Kreidler, W. J. Bulkley, C. H. Wilmerding, F. S. Gorton. It is understood that this committee is to hold itself in readiness to make suggestions and assist in a general way to promote the electrical interests in the Fair. From this committee a sub-committee of seven was appointed to immediately wait upon the architects, and confer with them regarding the work to be done in the near future.

The Central Electric Company recently decided to go into the electric railroad supply business and announce that they will shortly be upon the market with some railroad specialties entirely their own. These will be announced and illustrated in due time.

Chicago, January 31st. D. B. D.

OUR BOSTON LETTER.

Mr. H. E. Webb, of the Solar Carbon & Manufacturing Company, Pittsburgh, Pa., is on a business visit to this city. He will be a guest at the Boston Electric Club during his sojourn in this section.

Mr. James G. Baker, of the firm of Messrs. Baker & Foster, Beverly, Mass., dealers in electrical supplies, was in the city to-day making large purchases of electrical goods.

Mr. Frank M. Gilley, of this city, read an interesting and instructive paper before the Boston Electric Club, Thursday evening, January 29th; subject "Electrical Bohemia."

An Electric Railroad is about to be constructed between the towns of Piedmont and Anniston, Me., and probably will be in operation early in May next.

The Shipman Engine Company, of this city, has just shipped a two horse-power kerosene engine to the factory of the Nye Truss Company, Chicopee, Mass.

Mr. Leopold Schlegelmilch, president of the Germania Electric Company, Marlboro, Mass., sailed for Europe last Saturday, and will remain abroad about two months.

The New Britain, Conn., Electric Light Company, at its adjourned annual meeting recently, voted to increase its capital stock from $60,000 to $80,000. The present stockholders will get the preference on the new stock.

The Bristol, Conn., Electric Light Company started up its new station last Saturday. The new equipment includes two magnificent compound condensing engines from the works of the McIntosh & Seymour Company, Auburn, N. Y., installed under the supervision of Messrs. J. A. Grant & Company, of this city.

The Robinson Radial Car Truck Company has removed its offices from No. 95 Milk street to No. 180 Summer street. General-manager Robinson will be pleased to greet his many electric railway friends at his new quarters.

The Gethins Electric Manufacturing Company has been enjoying a steady increase in its business since the first of the year, more especially with the Southern and Western trade. It is authentically reported that the "Gethins" battery has been adopted by the Police Signal Service at Fall River, Mass.

The Thomson-Houston Electric Company has just closed a contract with the West End Street Railway Company, of Boston, to construct for the latter 34 generators of 480 horse-power each. The designs for these powerful machines will be furnished by the West End people.

Mr. T. W. Sprague, formerly the REVIEW representative in this section, and more recently connected with the Thomson-Houston Motor Company, has accepted a position with the Thomson-Van Depoele Electric Mining Company. Mr. Sprague graduated in 1887 from the mining engineering course of the Massachusetts Institute of Technology, and since then has had a varied as well as a practical experience among electrical industries, thus thoroughly fitting him for the important work he will undertake in his new field of labor. W. I. B.

Boston, January 31st, '91.

OUR ALBANY LETTER.

The Legislature held a regular session Saturday. Mr. Laughlin introduced a bill in the Senate providing that telegraph and telephone companies need not record chattel mortgages when a general mortgage on real estate is recorded.

Mr. Erwin, on Monday, introduced in the Senate a bill providing for a State electrical commission of three, appointed by the governor, non-partisan, four years' term; branch offices in cities of over 100,000 inhabitants; the commission to control all electrical apparatus; to put wires underground in all cities of over 125,000 inhabitants, and to investigate accidents. This was last year's general laws committee bill.

Mr. Roche introduced in the Assembly, Wednesday morning, a bill fixing the price for telephone service in cities of over 500,000 inhabitants at not to exceed $75 a year.

In the Assembly, Thursday, the following bills were introduced: Mr. Earl's, authorizing the lighting of streets in the town of Flatbush, Kings County, with electricity; Mr. Mullaney's, empowering the sinking commissioners of New York to sell privileges, permissions and franchises for the laying of pipes and conduits for hot water, steam or compressed air, or the erection of poles for electric power wires; Mr. Kelly's, amending the Brooklyn charter by placing fire department telegraphers and bell ringers on the same footing as foremen of the department.

On Account of the Heavy Sleet Storm which raised havoc with the telegraph wires in New York city, January 25th, Albany was made, for the time being, the central office for the State. The burden of the Western Union messages was once before transferred to this city, at the time of the great blizzard in '88. L. M. W.

Albany, N. Y. January 31st.

The Recent Storm.

During the week past thousands of wiremen have been at work clearing away the wreck caused by the long-to-be-remembered wet snow storm of January 24th. From the accounts at hand it appears that the most severe damage was done in the vicinity of New York. Boston and Philadelphia and many Connecticut towns fared almost as badly as New York.

In the metropolitan district, poles went down by scores and wires by hundreds. The Postal Telegraph Cable Company had not a single wire out of New York for a short time after the storm. The Western Union had but one. During the last days of the week messages were accepted by both companies subject to delay.

The fire alarm circuits were all down, and watchmen were stationed in high places to report fires, as in the olden time. Arrangements were made to have fire alarms struck from a number of church bells.

Electric light circuits suffered like the others. As a precautionary measure, the New York authorities ordered the electric lighting companies not to turn current onto the street lights, fearing accidents from the mass of tangled wires to be found at every other street corner. So the city was in darkness for several nights.

Probably the most severe losses fell upon the telephone companies. Over a third of the circuits of the Metropolitan Company were rendered useless. Even the splendid construction of this company could not withstand the storm.

The long distance lines suffered greatly. Between New York and Philadelphia there was not a pole standing upright for miles at a stretch. Some of these lines are now working with the poles propped up to a semi-erect position.

Notwithstanding the dangerous and confused condition of affairs in New York city, none but minor accidents were reported. Two or three horses were killed and several people were slightly shocked. The falling poles and wires did not hurt any one seriously. By extra vigilance the police and firemen kept things in splendid order in spite of the loss of fire circuits and street lights.

Matters are becoming rapidly normal again, although it will be a month or six weeks before everything is restored. Estimates of loss, at this time, are only guesses. A conservative figure for the loss in the whole storm area is $500,000.

Prof. J. P. Barrett, of Chicago, has been made chief of the electrical department of the World's Fair by Director-General Davis.

The First Decennial Celebration of Electric Lighting.

Secretary Allen R. Foote, of the N. E. L. A., has sent out the following proclamation signed by President Perry and himself. He accompanies it with the request that everybody help in carrying out the programme and assist in securing the presence of the "Old Guard" at the celebration. It is a novel and splendid idea, and we hope to see it go through successfully. The proclamation reads, in part, as follows:

It is fitting that the completion of the first decade of the commercial use of electricity for the services of light and power, be so celebrated as to commemorate in a proper manner, not only the unparalleled development of electrical industries, but also, properly to fix in the annals of history the rightful rank and place of American genius, skill and enterprise.

With this object in view, the National Electric Light Association invites all persons interested in electrical work or undertakings to join with it on the occasion of its thirteenth convention, to be held in Providence, R. I., February 17th, 18th and 19th, in celebrating the close of the first decade of electric lighting, and in honoring the pioneers of electrical industries.

The following persons, representatives of the principal departments of electrical developments, have been invited to participate in this celebration, as the guests of the Association.

Telegraphy—Dr. Norvin Green.
Ocean Telegraphy—Cyrus W. Field.
Telephoning—Alexander Graham Bell.
Arc Lighting—Chas. F. Brush.
Incandescent Lighting—Thos. A. Edison.
Electric Street Railroad—Hon. Henry M. Whitney.
Electric Welding—Prof. Elihu Thomson.
Technical Education in Electrical Engineering—Gen. Francis A. Walker.
Steam Engineering for Dynamo Driving—Gardiner C. Sims.
Organization of the National Electric Light Association—Geo. Worthington, editor of the ELECTRICAL REVIEW.

This occasion is the first that has presented itself for bringing together such a group of representatives. They owe to themselves, to the people of this country who have shown such boundless appreciation of the marvelous achievements of electrical invention, to the fame of American citizenship, and to succeeding generations, the duty of meeting while they may, in the presence of those who are devoting their abilities, lives and fortunes, to the development of electrical industries, and thus create an occasion for the writing of an historical chapter that shall give light to posterity for all time.

The Association also invites all pioneer workers in electrical undertakings to participate in this celebration by their presence and by contributing for publication over their signatures an account of some interesting episode in their early experiences with electrical work. The morning session of the convention, on Wednesday, the 18th, will be designated *Memorial Session*, and will be devoted exclusively to the recitation of such remembrances. All contributions will be published in the volume of proceedings after the convention, and will thus form a memorial of the beginnings of the electrical industries. Let every pioneer renew his youth or live over again the struggles or triumphs of the good old times when he was the first who had ever thought of the thing he was trying to do.

FINANCIAL.

Closing quotations of electric stocks, from F. Z. Maguire & Co., Electrical Securities, 18 Wall street, N. Y., Saturday, January 31, 1891. New York, Boston and Washington Stock Exchanges. Pittsburgh closing January 31.

NEW YORK.	
Western Union Telegraph Co	79¼
American Telegraph & Cable	83
Central and South American	*145
Mexican	*210
Commercial Cable Co	104
Postal Telegraph Cable	39
Edison General Electric Co	92
" " " Deferred	
Consolidated Electric Light	
Edison Electric Illuminating Co	70
United States Electric Light	80
North American Phonograph	
BOSTON.	
Thomson-Houston Electric Co	48¼
" " " Preferred	
" " " Series C	
" " " Series D	5⅞
" " International Co	
" Welding Co	
" European Welding Co	
Ft. Wayne Electric Co	12¼
TELEPHONE:	
American Bell	†185
Erie	49¼
New England	52
Mexican	.70
Tropical American	
MISCELLANEOUS:	
Edison Phonograph Doll	1
WASHINGTON.	
Pennsylvania Telephone	25
Chesapeake and Potomac	63
American Graphophone	8¼
United States Electric Light (Wash'ton)	138
Eckington and Soldiers' Home Electric Railway	55
Georgetown and Tennallytown	50½
PITTSBURGH.	
Westinghouse Electric Mfg. Co	13¾

* Ex. Div. †Ex. rights.

Telephonic News

*** The Sunset Telephone and Telegraph Company is preparing to extend its system from Sacramento to Auburn and beyond.

*** The request of the Hudson River Telephone Company for permission to put its wires underground was heard before the law committee of the Albany Common Council, last week.

*** At a special meeting of the stockholders of the American Bell Telephone Company, held in Boston, January 27th, a resolution was passed increasing the capital stock of the company from $12,500,000 to $15,000,000, and the number of shares from 125,000 to 150,000, each of the par value of $100.

*** The Erie Telegraph and Telephone Company has completed its underground work at Cleveland and in the Northwest, having now in conduits 1,875 miles of wire distributed as follows: At Cleveland, 587 miles; Minneapolis, 708 miles; St. Paul, 580 miles. The conduits are of sufficient capacity to accommodate all future demands for additional wires. The three cities mentioned have recently been equipped with the latest improved multiple switchboards.

*** The American Bell Telephone Company begun the new year with an increase of 1,047 in the number of telephones in use, under rental, that being the net output for the month ended January 20. The usual comparison follows:

January—	1891.	1890.		
Gross output	4,165	3,342	Inc.	823
Returned	3,118	2,241	Inc.	877
Net output	1,047	1,101	Dec.	54

The instrument account now stands as follows:

Dec. 20, 1889, there were in licensees' hands, under rental, as per last annual report	444,861
In the year ended Dec. 20, 1890, there were added	36,235
And in month ended Jan. 20, 1891	1,047
Making present total	482,143
Against number in use Jan. 20, 1890	445,962
Comparative increase	36,181

Don't Like the Tall Poles.

Judge Ingraham, of the Supreme Court, upon the application of Mary K. Sprague, of 182 West End avenue, has granted an injunction restraining the Metropolitan Telephone and Telegraph Company from erecting or maintaining poles or wires in Seventy-third street, between West End avenue and the Boulevard, and on West End avenue, between Seventy-third and Seventy-fourth streets. Mrs. Sprague is the wife of Frank J. Sprague, vice-president of the Sprague Electric Railway and Motor Company, consulting engineer of the Edison General Electric Company, and an ex-officer of the United States Navy. Mr. Sprague says that the poles of the defendant are 20 inches in diameter at the base and 70 feet high, and have 17 cross arms, each of which carries 10 wires. These are a serious obstruction to light and air, and one of them stands in front of his wife's house, on the corner of West End avenue and Seventy-third street. Mrs. Sprague objects, contending that the wires should be put underground.

Subway Decision.

Judge Truax, of the Superior Court, granted, January 26th, Edward Henry's application for a permanent injunction restraining the Mayor and other members of the New York Board of Electrical Control from making any contract with the Empire City Subway Company for the construction of subways, and from relieving the Consolidated Telegraph and Electrical Subway Company from any of its obligations under its contract with the board until the contract is terminated or has become inoperative or ineffectual.

A New Method of Study in Telephony.

BY PROF. CHARLES R. CROSS BEFORE THE SOCIETY OF ARTS.

The title of my paper may be somewhat misleading. I shall speak of a method of study of the movements of the electrodes of microphone transmitters known as the stroboscopic method. Perhaps I shall make the subject clearer if I spend some time in explanation of this method. There are many applications of this method, among the best known of which is cited the zoetrope, which consists of a band covered with the figures of animals in different positions, and placed inside a circular case. If this be set in rapid rotation and a person look through vertical slits in the case, the animals will appear to pass through a series of evolutions as if they were alive. Of course, every one is familiar with the fact that images thrown upon the retina of the eye persist for a little time. Rood has shown that the bright component of the spark of a Leyden jar is not over $\frac{1}{1000000}$ of a second; yet by this light we can see images and they remain impressed upon the retina for $\frac{1}{10}$ second or a greater length of time. If we have to examine a body in extremely rapid motion illuminated by a flash of light so brief that during the time of the flash the body does not move perceptibly, the body will appear to the eye to be at rest. This is familiar in the appearance of a rapidly moving carriage when illuminated by a flash of lightning; and in instantaneous photography, the spokes of the driving wheel of a locomotive at full speed are sharply defined in the picture.

Now, if, instead of a single flash, we have a series of flashes so timed that in the interval between them the object passes through the phases of its motion and returns to its former position, it will still appear at rest. If a wheel have 20 spokes and make one revolution per second, in $\frac{1}{20}$ second the second spoke will take the place of the first, and if in addition we suppose that there are 20 flashes per second, the spokes will appear at rest. On the contrary, suppose that the flashes are at the rate of 21 per second, then it is clear that instead of a flash illuminating wheel when the second spoke is exactly in the position of the first, it will have gone a little further and will appear to have moved $\frac{1}{21}$ of a revolution forward; 20 per second in practice is not rapid enough, but if the number is 30 to 40, they will blend together, and the body will appear to be moving at a slow rate. If I use a tuning fork making 128 vibrations per second and illuminate such vibrating fork by 128 flashes of light per second, it will appear to be at rest. Suppose that instead there are 129 flashes, then the fork will appear to move slowly back and forth being successively illuminated for a short space of time and seen in the various positions of its path. On the other hand, with a smaller number of vibrations, say 127, the second flash will not find the fork quite back to its original position, and it will, therefore, appear to move backwards.

This method has been used by Mr. Jacques and myself in determining or keeping constant the revolution of a wheel at 64 turns per second in a case where a speed counter was undesirable. In a dark room a fork making 64 vibrations per second was illuminated by flashes at the same interval and viewed through a slit in the revolving wheel; when the fork appeared to be stationary, of course, the wheel was revolving at the same rate as the fork. A still further application of this method is the measuring of the rate of vibration of a body giving a sound of a particular pitch.

An electrically driven tuning fork making 32 vibrations per second placed in front of a screen was here illuminated by the lime light, and Professor Cross continued: I have here in front of the object glass of this lantern a round dish with round holes which are not perhaps best for the purpose, but a narrow slit does not give enough light. You will notice that the shadow of the prongs of the fork looks blurred, and as I turn this disk rapidly you will see the prongs sharply defined, at times stationary, at times apparently slowly moving back and forth.

By the use of similar apparatus, Toepler has made evident the motions of sound waves in the air. The sound was produced by the snap of an electric spark, and the light of the spark, of course, caught the sound wave always in the same position. In this way he was able to see slight differences in the density of air in the same manner as in looking over a hot stove at a bright object. Even photographs have been taken of this interesting phenomenon.

(At this point, the professor dissected a large *papier-maché* ear.)

The same method has been used in studying the motion of the small bones of the ear, both as regards their amplitude and form of vibration and the ratio of the vibration of one bone to the next. In passing I might remark that Professor Richards of the mining department has used this method to illustrate the growth of crystals. A series of pictures is drawn on a band representing the various stages of formation of a crystal, and in looking at this through the revolving zoetrope, a student may see the changes take place before his eyes.

With Mr. W. W. Jacques, electrician of the Bell Telephone Company, I find applied this method to a study of the amplitude of the motion of the electrodes of a telephone transmitter, looking at the blurred image through a microscope. The electrodes were illuminated by flashes of light and the vibrations, though minute, were great enough to be visible through the microscope. The fork made 128 vibrations a second and was lighted by the 128 flashes per second of the electric sparks made at the moving electrode of the fork. The electrodes then appeared to rest. But with 127 or 129 vibrations per second the electrodes just as in the case of the fork before mentioned appeared to move. By these means not only the rate, but what is more important, the amplitude of vibration as well, was observed and studied.

In these experiments a fork of higher pitch was used, and the extra current caused by the electro-magnet of the apparatus was considerable when a large battery was used. By a lens the light of the spark was concentrated on the electrodes, and these were viewed through a miscroscope having a micrometer scale attached. An organ pipe blown by a constant blast placed near the transmitter disk gave middle C 256 vibrations per second. The tuning fork made 128. But as the electrodes were illuminated at each second vibration, the resulting image was the same and the arrangement was more convenient, as it is difficult to operate continuously a fork giving 256 vibrations a second, and a pipe an octave below did not give a clear sound.

The absolute motion of the electrodes is of no importance, but the relative amplitude, *i. e.*, the amount by which the hammer electrode impresses itself upon the anvil electrode is the subject of interest. This is obtained by finding the absolute motion of both and subtracting one from the other. However, in the earlier forms of transmitters the anvil electrode did not appear to move even when magnified 500 diameters. It was easy to get sufficient light from the sparks and the electrodes appeared as silhouettes. The organ pipe could be easily turned to 250 or 259 vibrations, generally flattened until the electrode was seen going through its motion slowly, and then by fixing the eye on a particle of dust its amplitude could be estimated. The dust trouble was considerable, as the electrodes became dirty as well as the mercury, which could not be covered with alcohol as that would be set on fire by the strong sparks.

It has been thought that the arc light is the most brilliant. Assuming a duration of $\frac{1}{1000000}$ of a second (and the bright component is not longer than this) and the illuminated surface being magnified 500 diameters; that the electrodes were brightly lighted shows that the spark is a far more brilliant light than the arc.

Lockyer's method of studying the bright lines of substances vaporized by the spark from a Leyden jar has always puzzled electricians, for the ease with which these lines have been observed has been an evidence of a higher temperature than that of substances volatilized in the electric arc.

As it would be tedious to discuss at length the results of our experiments, I will give a brief summary. With a telephone of recent form in circuit the result as heard by the ear is interesting when compared with the appearance of the electrodes as seen by the eye. When the organ pipe is placed close to the transmitter diaphragm, there was constant sparking, a deafening sound in the receiving telephone and a relative amplitude of the electrodes of $\frac{1}{1000}$ inch. With the amplitude $\frac{1}{10000}$ inch sparking was frequent, but the sound not deafening. On the amplitude being reduced to $\frac{1}{15000}$ inch the sound was gratingly harsh but of a distinct pitch, which before had been lost in the crackling. The quality of the sound of the pipes was not distinguishable as that of an organ pipe until the amplitude was further reduced to $\frac{1}{10000}$ inch, and even more, to get rid of squeaky overtones or for first-class transmission. In a general way, we may say that a relative movement or amplitude of the electrodes of more than $\frac{1}{40000}$ inch is not consistent with good transmission. This was the maximum amplitude. We have no idea how small the minimum may be.

With the pipe one foot distant the amplitude was reduced to $\frac{1}{80000}$, and on being moved 30 feet away to the furthermost end of the room, there was still the same loudness, but the amplitude must have been infinitesimal.

The critical arc of the maximum amplitude with good transmission in the case of platinum and carbon contacts, as used in the Blake transmitter, is very large compared with the other forms. This shows the Blake transmitter to be an admirable instrument. In the case of the Blake transmitter both electrodes had to be measured. In other transmitters there must be no motion of the anvil electrode for good transmission, but an immense movement can take place in the Blake.

It is now proposed to employ Lissajou's optical method of combining two simple harmonic motions. A microscope objective is place on the end of an electrically driven tuning fork and the image of a bright point on the vibrating electrode watched through the objective and the stationary eye-piece of the microscope. In this way some idea of the form of the vibration may be obtained, if not too complicated.

It is further proposed to determine the wave produced in electric light transformers. An ordinary galvanometer is not affected by the rapidly alternating currents as the needle does not move quickly enough, but there must be a thrill of the needle and if slow enough, its presence and form may be seen and studied. By attaching a mirror to the needle and passing an electric light current through the galvanometer coils, the slight motion might perhaps displace the beam of light enough for the purpose. It is doubtful if this can be done in the case of the telephone, but the subject is not altogether hopeless.

Central Union Telephone Company.

At the annual meeting of the Central Union Telephone Company, last week, the report for the year showed an increase of 2,000 in the number of telephones used, making the entire number now used 20,245. The income for the year increased over $100,000 and after paying all fixed charges, dividends, etc., the company will place about $150,000 in the reserve fund. The capital of the company is $6,605,300; authorized capital, $10,000,000. The officers elected were: H. B. Stone, president; W. S. Chapman, secretary and treasurer; and Messrs. Browne, Cummings, Kelly, Stone, Clowry, Wallack, J. Russell Jones, Griggs and Albree, as directors. The company pay five per cent. annual dividends, and their stock is now quoted at 57¾ to 59.

The corporation is doing business in Illinois, except in the five counties of which Cook county is about the center; the State of Ohio, except Cleveland and Cincinnati, and in the cities of Des Moines, Dubuque, Cedar Rapids, Keokuk and Ottumwa, Iowa, as well as the counties in which they are located.

Telegraphic Transmission on Long Subterranean Lines Without the Use of Relays.

ABSTRACT OF A PAPER READ BY HERR GRAWINKEL, CHIEF ENGINEER TO THE GERMAN POST OFFICE, BEFORE THE BERLIN ELECTRO-TECHNICAL SOCIETY.

As is generally known, telegraphic transmission is not so easily carried out on long subterranean as on aerial circuits. On underground circuits of less than 190 miles retardation phenomena are scarcely noticeable, but for greater distances than this, electrostatic effects become increasingly troublesome, and since the underground telegraph system of Germany has assumed large proportions, the authorities have tried to annul these pernicious phenomena in a variety of ways. For instance, a short path to earth has been offered after each signal at either

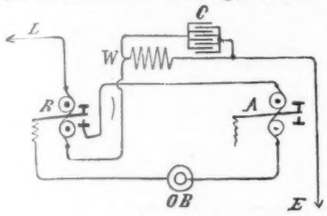


FIG. 1.

end of the line to the discharge current; alternate current working has been attempted, and condensers have been used to neutralize the charge of the cable by one of the opposite sign from the condensers. None of these methods—some of which involved the addition to the ordinary instruments of costly and cumbersome apparatus, fulfilled the desideratum of enabling messages to be transmitted as quickly and clearly as on overhead circuits of equal length. The most efficacious method was considered to be the employment of relays at every 100 or 150 miles, and even then the rate of transmission was considerably less than on overhead lines. Recently an apparatus was devised by Delany, of New York, which, although intended primarily for use on long submarine cables, seemed equally suitable for subterranean work. By means of the Delany key we can, it is true, send Morse signals much quicker than has hitherto been possible, but it necessitates the employment of complicated apparatus, liable to get out of order. The engineering staff of the German post office, therefore, who had been ordered to investigate the practical value of the Delany device, set to work to try and obtain the same result in a simpler manner and without altering the instruments at present in use. Now, augmentation of the speed of transmission depends on realizing three conditions: (1) Decrease of battery resistance; (2) acceleration of the discharge of the cable; (3) compensating the self-induction of the receiving apparatus. It is easy to fulfil the first condition, either by arranging the cells in parallel or by using secondary cells. The disturbance produced by self-induction is connected with the effect of the cable discharge. The tongue of a sensitively ad-

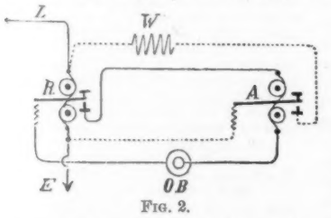


FIG. 2.

justed relay should fall and close the local circuit as soon as the first part of the current reaches the receiving end; but the release of the tongue is retarded by the discharge current, and this retardation is prolonged by self-induction. To neutralize these effects recourse may be had to an old device proposed by Maxwell.

In this arrangement a resistance W, in shunt with a condenser C, is placed between the receiving relay R and earth E (Fig. 1). The resistance must bear a certain definite relation to the capacity of the condenser, which relation has to be determined by experiment. The installation of a condenser in the first place permits of a more rapid rise of current at the receiving end, since it fulfills during the first instants, of charging the functions of an earth. The attraction of the tongue of the relay is thus favored. Moreover, the discharge current of the condenser and the "extra-current" from the line are mutually destructive, and the disappearance of the magnetism is thus accelerated.

In the first experiment with this arrangement the Berlin-Hamburg cables were looped, forming a circuit 272 miles and having a resistance of 5,151ω, and a capacity of 150 microfarads. In the second experiment the Berlin-Frankfort cables were looped—length, 350 miles; resistance, 4,279 ohms; capacity, 120 microfarads. The resistance of W was 9,430 ohms, and the capacity of C 20 microfarads. Fifty Tudor accumulators were employed, reinforced by 40 primary cells. In the first case 300 primary cells arranged 100 in series and three in parallel were used.

So far as speed of transmission was concerned these experiments were satisfactory. Representing the ordinary rate of transmission of Morse signals, without translation, by 100, the speed of transmission when a shunted condenser was used was 131, or nearly 30 per cent. greater. It must, however, be remembered that the ratio of W to C has to be determined in each individual case, so that the use of this method does not tend to certainty of transmission, and it may derange the working of the line. Attempts were, therefore, next made to attain the same increase of speed without condenser, and this result was finally attained by the very simple arrangement shown in Fig. 2.

In shunt with coils of the relay a variable resistance W is placed, and this resistance only comes into play when the "inker" operates. The effect of this arrangement is to accelerate the discharge of the line. When the current wave at R has attained sufficient strength to work the relay, the Morse recorder A operates. The remainder of the wave then divides, some going to E *via* W. The current in R is of course diminished the smaller W is made, and the release of the tongue is thus hastened. The tongue must not, however, be released before a proper Morse signal has been recorded, and the resistence of W must; therefore, be properly proportioned to that of R. It has been found useful to prolong the effect of the shunt circuit, which can be effected by fixing a light spring to the lower end of the "inker" lever so as to hasten the closing of the shunt circuit. If this circuit is of too low resistance the tongue of the relay is released too soon, while if the resistance of W is properly adjusted, the current flowing in R, together with the "extra current," act long enough to allow a signal to be produced.

Favorable results have been obtained with this arrangement in transmitting Morse signals without translating devices over a subterranean line connecting Berlin and Frankfort. The relative speeds were: Ordinary Morse, 100; condenser and resistance method, 131; arrangement shown in Fig. 2, 145. Further tests of this method on underground lines have shown that Morse signals can be transmitted at the same rate as on overhead circuits up to distances of more than 375 miles, and that on longer an increase of speed of 30 per cent. is obtainable, when compared to the old device of fixing relays at every 100 miles. When a line is more than 625 miles (1,000 kilometres) long it is advisable to install midway a relay on the shunt principle. One circumstance which contributes in a great measure to acceleration of transmission is that it is no longer necessary to employ such sensitive relays as formerly. Sticking of the relay tongue and the consequent blending of signals is thus avoided. Readjustment of the relay is also less frequently needed. Let us hope that this new device may be equally applicable to the transmission of Hughes signals on underground circuits.

Would do the Best he Could.

A western newspaper recently received the following answer from a person who was requested to act as subscription solicitor: "From a perusal of your sample copy I consider your paper to be a dicknailer of the first water; but, owing to the fact that the crops were a failure last year, and the blizzard in January wiped out the cattle, and that the population in this place is only two families and a water tank, and one of the families is away at the hot springs, and the other one, which was only Jed Roach himself, is dead since December, and as, dear sir, I am going East, because I have no society except freight trains and telegraph messages, that do not stop as they pass by, I do not think it would pay me to make much of a boom for your paper here, even if you increased the commission and threw in a three-bladed pocket knife. You asked me to hand your letter to some other person in my town, provided I cannot work for you myself. I have no one to hand it to, but I will nail it on the water tank when I leave."

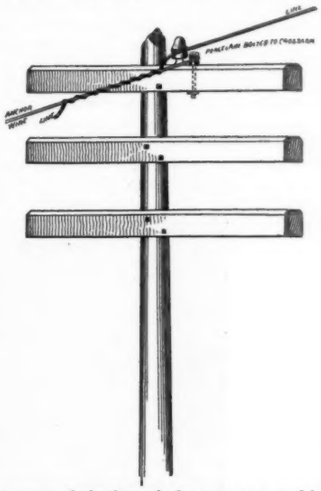
David Brooks, the inventor of a system of underground electrical conduits, whose excellence has been proved by tests extending over several years of actual service, has, with the approval of his associates, offered his system free to the city of Philadelphia for use within the city limits.

A Device to Prevent Wires Breaking.

Last September by the breaking of some wires a police patrol circuit in Buffalo, N. Y., came in contact with an electric railway trolley wire with the result that the instruments of the patrol system were damaged to the extent of several hundred dollars.

Since then Superintendent Charles Plumb, of the Buffalo police electrical department, has been engaged in working up a device to prevent any more such accidents. His scheme is shown in the accompanying illustration.

Where the police wires are to cross the trolley or electric light wires, he places an iron anchor wire on the poles on each side of the crossing. This wire is anchored to the cross arms of the poles on porcelain insulators by being wound around the groove in the insulator in such a manner that when it is sagged by heavy winds it will work as easily as if it were on a swivel. The porcelain insulators are fastened to the cross arms of the poles by a heavy iron bolt, which



passes entirely through the cross arm, and is fastened underneath by a nut. This makes the anchor wire as firm as the pole which holds it, and at the same time is a non-conductor. Now that this is completed the copper conducting wire is taken from its junction with the ordinary glass insulator a few inches from the anchor wire, and after allowing about six inches of a loop for expansion and contraction, is wound loosely around the anchor wire in a spiral form from end to end, and fastened at the opposite side in the same manner described above.

This takes the entire strain off the conducting wire and throws it on the strong anchor wire, and the fact that it is so loosely wound makes breakage from contraction or expansion impossible. In case it breaks at its junction with the glass insulator it cannot fall, as it rests on the anchor wire, and thus is kept from contact with the heavily-charged wires which may be under it.

Telegraphic Legal Decisions.

In Georgia, according to a recent decision of the Supreme Court of that State (Western Union Telegraph Company *vs.* Nunnally), a suit under the State act of 1887, for the recovery of a penalty against a telegraph company for failure to deliver a message in due time, is barred within one year from the time the company's liability was discovered, or by reasonable diligence could have been discovered.

An interesting decision, involving the liability of a telegraph company for a mistake in transmitting a telegraphic message, was rendered by the New York Court of Appeals in the case of Pearsall *vs.* The Western Union Telegraph Company. It appeared that some one on behalf of the plaintiff delivered to a telegraph operator at Great Neck, without prepayment, a telegram written on an ordinary sheet of note-paper, addressed to T. W. Pearsall & Co., New York, telling them to buy 1,000 shares of Western Union. The message was delivered at the place directed and paid for, but the words "& Co." had been omitted from the address. No person in the office of the firm had authority to open a message thus addressed, and the telegram remained unopened until Mr. Pearsall arrived. In the meantime Western Union had gone up in price, and when the plaintiff purchased the stock he had to pay a higher rate than if it had been purchased at the time he telegraphed. He brought suit to recover the amount represented by the advance in price, and recovered.—*Bradstreet's.*

TELEGRAPHIC

.... The telegraphers' station agents' strike on the St. Paul road has collapsed.

.... The German Government announces a reduction in telegraph rates to 4 cents, American money, per message.

.... Telegraphic communication in Berlin, Paris and London was greatly interrupted last week, owing to the stormy weather.

.... The telegraph and electric lighting companies of St. Louis will demand separate conduits for their wires which have been ordered underground.

.... The cable between Angel Island, Cal., and Tiburon, was taken up last week by the lighthouse tender "Madrona," and a new one will be laid as quickly as possible.

.... The receipts of the test offices of the Western Union Telegraph Company for the last week are reported as amounting to $234,000, being an increase over the corresponding week a year ago of $23,700.

.... The Central District Telephone and Printing Company, by its local manager, at Warren, Pa., has commenced suit against the Warren Electric Light and Power Company to recover damages caused by induction of the electric light wires.

.... A block of Johnston Electric Train Signal Company's stock has been purchased by a syndicate of Boston bankers. The company has increased its facilities, and reports a good demand for its products, consisting, aside from the signal, of special electric supplies. The stock is quoted at $5 per share on a par value of $10.

.... An English cable construction company has offered the Dominion government to lay a submarine cable connecting Sable Island with Nova Scotia and operate it for 10 years for an annual subsidy of $12,000 a year, the cable to become the property of the government at the expiration of the 10 years. The cost of constructing and laying is estimated at $100,000.

.... A bill has been introduced in both houses of Congress to incorporate the Pacific Cable Company, to lay and operate a cable between San Francisco, Hawaii, Samoa and Japan. The company is to have a capital of $5,000,000, and the bill provides for the payment to it of a subsidy of $200,000 yearly for 15 years, and a majority of the directors are to be citizens of the United States.

.... The fact that the New England Printing Telegraph Company had its wires working all right just after the storm, from Boston to Providence (as far as they have built), gave rise to the suggestion that they lay a submarine cable from Providence to New York. By this means it is believed that an efficient telegraphic service could be obtained between Boston and New York in all kinds of weather.

Providence Electrical Exhibition.

The permits for space in the electrical exhibition to be held in connection with the meeting of the National Electric Light Association, at Providence, R. I., February 17th, 18th and 19th, have been prepared by Gen. C. H. Barney, chairman of the committee on exhibits. These permits are to be presented to the superintendent of installation, who may be found at the exhibition hall from and after eight A. M., Monday, February 16th.

The committee has arranged with responsible parties for cartage, insurance, carpenter work, sign painting and wiring, and exhibitors are advised to deal with these parties. Their addresses are given in the permit. All goods shipped for exhibition should be plainly marked with the name of the exhibitor himself, for instance: "John Smith, Electrical Exhibition, Union Hall, Broad street, Providence, R. I."

* * Derby and Chester, N. H., want an electric railway.

* * The Stewart rapid transit bill passed the New York Senate, January 28th, by an unanimous vote.

* * Electric street cleaners, operated from the overhead electric railway wires, are the latest thing talked about in Pittsburgh.

* * The following directors were elected by the St. Louis Electric Supply Company at a recent meeting: H. H. Reese, H. C. Scott, E. Ruebel and W. L. Scott.

* * The employés of the Westinghouse Electric and Manufacturing Company will hereafter be required to work all day Saturdays on account of the pressure of orders.

* * An eastern syndicate has made a bid for control of the stock of the Seattle, Wash., Electric Railroad, but there is an indisposition to accept the price offered or to part with control.

* * The stockholders of the Worcester, Leicester & Spencer Street Railway, met last week, and accepted the decree of the location in the town of Spencer, Mass., granted by the selectmen of that town.

* * The Thomson-Van Depoele Electric Mining Company, of Boston, is at present making an electric mining pump, which will be the largest of the kind ever made. The pump will be operated by a special type motor of 85 horse-power. The machine itself will be horizontal duplex and will pump water against a 15,000 feet head, which is an unusually high one.

* * The recent experimental work of the Thomson Electric Welding Company is very interesting. One of the results is a wrought-iron pipe, which, upon test, bursts all along except at the weld. Another is return bends of iron pipe made to withstand a test of 300 pounds, but which withstood 750 pounds. The machines can successfully weld a six-inch pipe. They will yet weld as large a pipe as 12 inches.

* * The Cincinnati Inclined Plane Railway Company has perfected its bond in the sum of $5,000, as required by the Supreme Court, and will begin to run its cars through to St. Bernard. The bond is to secure the Telephone Company in case the final decision of the suit between them is in its favor, and damages are awarded it. The line as thus extended is the single trolley, against which an injunction was in force, as to that part of the line beyond the Zoological Gardens, until the case got into the Supreme Court. The Telephone Company is understood to desire an early hearing of the case in the Supreme Court, but as yet has made no formal application to take the case out of its order.

* * President Whitney, of the West End Company, Boston, says: "The statements that have been made concerning our increased expenses by reason of the recent storms have been very much exaggerated. We operate about 160 electric cars, of which about 20 are on the Boylston street route, and only on this route were any motors damaged. The increase in our gross earnings this month, notwithstanding the storms, is more than all the damage or increased expenses sustained by us and the Thomson-Houston Company, which maintains the electric equipment, combined. Our new large cars are carrying from 30 to 50 per cent. more passengers than the cars they replace. Our gross income is still increasing as compared with last year by more than $1,000 per day, but concerning this we shall make a full statement to the Railroad Commissioners at our hearing to-morrow."

Standard Underground Cable Company.

The annual meeting of the Standard Underground Cable Company was held January 27th at the company's offices in the Westinghouse building, Pittsburgh. It was well attended by the stockholders, there being nearly 9,000 shares of stock represented. Mr. George Westinghouse, Jr., was elected president, and the following gentlemen were elected as directors: George Westinghouse, Jr., Mark W. Watson, John H. Dalzell, Robert Pitcairn, Joseph W. Marsh, James H. Willock and H. S. Sweitzer.

The annual report of the board of directors was exceedingly gratifying to the stockholders. It showed that the company's business for the year 1890 amounted to $917,946.62, representing an increase of 50 per cent. over the business done in the year 1889. The net earnings for the year 1890 were $204,913.78, or a little over 20 per cent. on the entire capital stock; two dividends aggregating $30,000 were paid during the year, leaving the net addition to surplus account $174,913.78. The company's net surplus on December 31st, 1890, was $315,735.85.

The raw materials used by the company during the year were as follows: 342,549 pounds of cotton and jute yarn, 1,625,209 pounds of copper, 1,853,538 pounds of lead.

During the year 1890 the company added 84 new customers to its already large list, and its business covers a wide range of territory. The markings on Johnson's commercial chart of the world show that the company's business is not limited to the United States, but extends to Mexico, South America, Europe, Africa, Asia, China and Japan.

Trolley Systems and Snow.

So much has been said about the trolley system of electric street cars, and so many reckless assertions made of its failure in case of storms, etc., that the following testimony from the Boston *Journal* of the way it worked in Boston during the recent snow may be of interest and value:

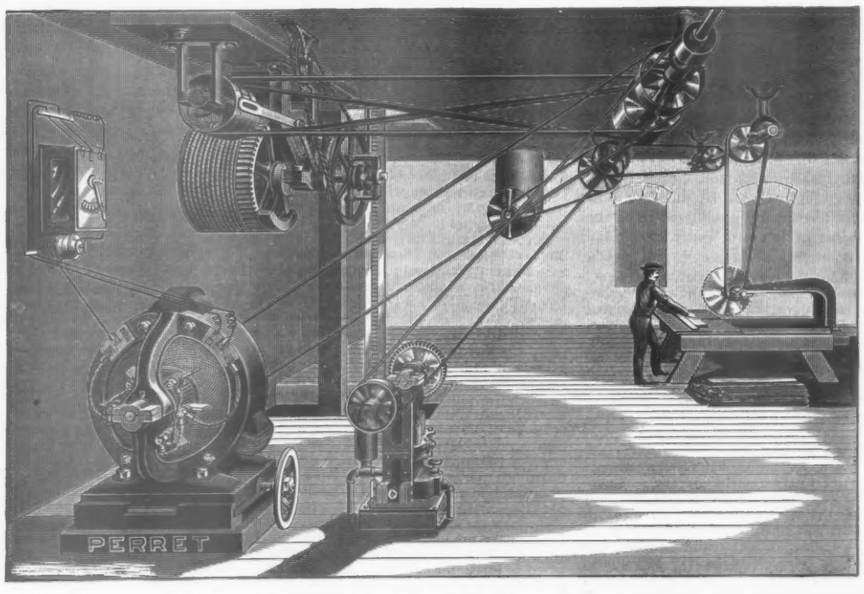
"Every one wants to know how the street cars got along—not those which are drawn by horses, for their slow movements in such times of storm are well enough known—but those which the mysterious electricity propels. Well, the trolley system has now had about every test which winter can devise, and it has come off triumphant. Wet snow and dry snow, water on the tracks and ice on the wires; they have all had their innings. Yesterday's snow, which deposited itself on both rails and wires, was of the wet, sticky variety; but the electrics ran all day with comparative indifference to it. Even the six-wheelers made their accustomed trips with entire regularity and without much delay. The sweepers and the new plows performed their functions to the delight of everybody. There has not been a storm this winter that has so slightly affected the running of the Cambridge electrics. And the same may be said of the Boston lines."

One Perrett Motor's Work.

The Elektron Manufacturing Company, of Brooklyn, about four months' ago, made an interesting electrical power installation in New York city. At a desk manufactory in Fulton street, a 10 horse-power Perrett motor placed in the basement operates a pump used for raising water to a tank on the roof; a fan for ventilating and keeping the cellar dry; a buzz saw for cutting lumber for making packing boxes; a passenger elevator and a freight elevator, both of Frisbie manufacture. The freight elevator is not shown in the illustration. Current at 110 volts is supplied from the Edison station in Pearl street. The motor runs at 600 revolutions per minute and is equipped with Perrett self-feeding carbon brushes and self-oiling bearings. It runs entirely free of sparking and requires a minimum of attention, one filling of the bearings lasting a week.

The compact appearance of the whole outfit is clearly indicated in our illustration. It is just the kind of a plant to effectually demonstrate the supreme advantages of stationary electric motors over steam power. No room is wasted, scarcely any care is needed, the installation is safe and comparatively inexpensive.

The Perrett motors are making a name for themselves as the embodiment of simplicity, economy and compactness.



A Perrett Electric Motor Installation.

Said to be Aimed at Electric Street Railways.

Mr. Briets has introduced the following bill in the Texas legislature as an amendment to chapter 3, title 17, of the penal code of the State:

Section 1. Be it enacted by the legislature of the State of Texas, that chapter 3, title 17, of the penal code of the State of Texas be amended by the addition of the following article:

Article 677 *a*. If any person shall intentionally break, fell, cut or tear down, misplace or in any other manner injure any electric light or telephone wire, post, machinery, or other necessary appurtenances to any electric light or telephone line, or in any way willfully obstruct or interfere with the electric current on the said electric light wires, or with the transmission of messages along said telephone line, he shall be punished by confinement in the penitentiary not less than two nor more than five years, or by fine of not less than $100 or more than $2,000.

Section 2. The great necessity for this amendment creates an imperative public necessity and emergency, and requires the constitutional rule that bills be read on three several days in each house, be suspended, and the same is therefore suspended, and this act to take effect and be in force from and after its passage, and it is so enacted.

Introduced in the house January 16th and referred to judiciary committee No. 2.

The Edco Storage Battery System.

We are informed by Mr. D. H. Bates, vice-president and general manager of The Accumulator Company, that the negotiations which have been pending for 60 days between his company and The Eckington & Soldiers' Home Railway Company, of the District of Columbia, have resulted in the execution of a satisfactory contract for the equipment of the new G street branch of that road with six storage battery cars.

The Eckington & Soldiers' Home Railway Company was one of the first street car roads in the United States to adopt electricity as a means of propelling its cars, and the Thomson-Houston system of trolley wires installed several years ago upon that road, extending from Seventh street and New York avenue in Washington, D.C., to Eckington and the Soldiers' Home, in the northeastern part of the city, has been one of the most widely known and successful in the country. Congress, however, will not permit the railway company to erect any more trolley poles, particularly in the heart of the city. It became necessary, therefore, for the Eckington Company to look around for another system for its extension or branch from New York avenue and Fifth street, *via* the Pension Office and G street to Fifteenth street, opposite the Treasury Department, including a proposed extension to the Capitol.

Col. George Truesdell, the president of the Eckington and Soldiers' Home Railway Company, has been for several months examining into various systems of electrical propulsion, and finally concluded upon the Edco system as one fully meeting all the requirements of his company in the premises.

The Edco system is the invention of Mr. W. W. Griscom, the president of the Electro-Dynamic Company, of Philadelphia, the initials of which title serve to form the word "EDCO." The Accumulator Company some time ago made a close working arrangement with the Electro-Dynamic Company in order to avail itself of the best possible system for motive power and lighting, the Electro-Dynamic Company having proved to the satisfaction of the officers and experts of the Accumulator Company that its work, both in construction and design, was of a high order of excellence.

The cars for the Eckington and Soldiers' Home road are being manufactured by the J. G. Brill Company, of Philadelphia, and will be upholstered and finished in handsome style, lighted by electricity, equipped with the Edco system of motors and gearing, the gearing running in oil with dust-tight covers for motors, and with a sufficient number of "23 M" type accumulators, made by the Accumulator Company, to accomplish an average speed of eight miles an hour, and a maximum speed, when desired, of 15 miles an hour.

The Brill Company has promised the cars for the last of March, and they will be equipped and installed in running order within about 60 days thereafter. The factory of the Electro-Dynamic Company is being run three nights a week in order to keep up with its orders for dynamos, motors, gearing, switches, etc.

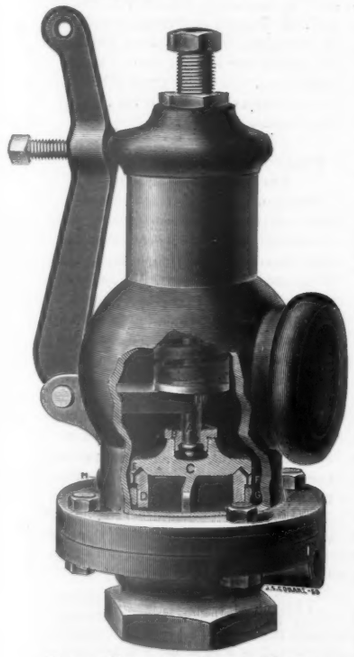
The six storage battery cars which the Accumulator Company is under contract to deliver to the Dubuque Street Railway Company, are rapidly approaching completion, and will be delivered and installed some time next month.

An Important Industry.

The varied and useful products of the Crosby Steam Gauge and Valve Company, of Boston, are so well known to electric light companies in this country and abroad that no attempt will be made here to give a notice in detail. Among the instruments and appliances solely manufactured by the company named, the Crosby steam engine indicator, pop safety valve and steam pressure gauge are probably the most familiar to electric light managers and superintendents; and the fact will be conceded that these appliances play an important part, respectively, in the steam plant equipment of an electric light station.

A visit was made recently by the writer to the factory of the Crosby Company at Boston, where several hours were pleasantly passed in observing the processes of making the products in the several departments. The main building of the factory is three stories high, not including a basement. The building is an attractive one, being of faced brick with granite foundations and window cappings of brown freestone. Dimensions of building are 125x45 feet, with an L, 107x48 feet. The basement floor is concrete, as are also the ground floors of the adjoining buildings belonging to the company. The factory offices occupy a large space in the northeast corner of the first floor in main building. These are spacious and well appointed, and combine all the modern appliances for comfort and convenience. Part of the first floor is devoted to the manufacture of the Crosby pop valve.

In the rear of the same floor is an extensive department, equipped with massive and expensive machinery, where the celebrated Crosby single bell chime whistles are made and tested. In a separate room, just off the valve department, is the valve testing room, where all valves are tested and adjusted under steam before being passed to the shipping department.



CROSBY-MEADY POP SAFETY VALVE.

Second floor front, is the tool department, where special tools are made for the various kinds of work manufactured in the factory. In the same room is made a variety of boiler fittings, comprising water gauges and gauge cocks and also boiler test pumps and gauge testing apparatus. The appliances made in this and every other department are separately and thoroughly tested. Specially designed machinery is used in the testing work, and every precaution taken to ensure absolutely reliable instruments. In testing the gauges, the workmen performing this labor are supplied with automatically controlled pressure, independent of each other's bench, thus greatly facilitating the work, and ensuring perfect accuracy of the instruments. The system is controlled solely by this company. In the same department is also a novel and remarkable apparatus for testing vacuum gauges. With it no difficulty is experienced in getting 30-inches vacuum. So simple and easy is the *modus operandi* of this testing machine, that it can be operated by a child; yet the results obtained are absolutely accurate. The Crosby Company is the patentee and sole manufacturer of this invaluable machine.

The patent pressure gauge testing apparatus

CROSBY STEAM ENGINE INDICATOR.

is also made in this department. This consists of a series of weights acting on known areas through the medium of oil, which is forced into the spring of the gauge. This standard of testing pressure gauge is recognized by engineers as infallible, and is rapidly coming into general use among those who cannot afford the expense or room for a mercury column.

The large department occupying the front of the third floor is devoted to the manufacture of the Crosby improved steam engine indicator, one of the most important of the company's products. Here will be found many skilled and experienced employés constantly at work on special orders for electric light companies, engine and steamship builders, navies, technical schools and engineers. This little instrument has been ably termed the stethoscope of the steam engine, and no engineer's outfit is considered complete without it. A large proportion of the orders for this instrument come from engineers who desire to attain the highest proficiency in their calling, and to such the company makes special terms which enable almost any ambitious engineer to become the owner of one of these invaluable instruments.

Also on the third floor, and adjoining the indicator department, is the marine clock room, where several expert artisans are engaged in fitting up various grades of clocks for locomotive, marine and engine use. Nearby is another department where a busy lot of men are making revolution counters and fire department supplies. In the rear end of the third floor is the lubricator department, where the popular and reliable Crosby sight feed lubricator is manufactured in large quantities.

Passing from the "bee-hive" departments of the factory, through the offices, thence to the basement, the visitor is greeted with a cheery sight. A suitable part of the basement is neatly and comfortably fitted up as quarters for the company's employés. It is divided off into reading and writing rooms, lunch room and lavatory, all furnished with modern improvements. In the reading room is a handsome library, supplied with choice and instructive books, and files of nearly all the leading electrical papers and illustrated journals. Writing material, chessmen and checkers are at hand. All these enjoyable features are at the disposal of the employés outside working hours. These are only a few of the many good things which have been contributed by the company to enhance the comfort and well being of its employés. The general deportment and appearance of the employés in their respective departments will go far to show the good results arising from the excellent policy pursued by the company toward its workmen. The men are rarely late, and during working hours are attentive to their respective duties. Wherever met, they are neatly dressed, polite and cheerful. They have an organization known as the Crosby Steam Gauge & Valve Company's Mutual Aid Society, the principal object being to relieve its sick or disabled members. Each workman subscribes 25 cents per month, and the company contributes an amount every month equal to the aggregate sum subscribed by the members.

Electric Wiring in Philadelphia.

A circular issued by the electrical department of the Philadelphia Fire Underwriters' Association contains much interesting information in regard to electric lighting. It says there are over 5,000 buildings in the city wherein electric currents are used for light and power purposes. Of this number, 287 buildings (seven of which are dwellings) have their own apparatus, the latter varying in size from a 20 light to one of 4,000 lights. The number of lights furnished by these private plants aggregate 80,258 incandescent and 3,325 arc lights. One store contains 482 arc lights. There are 15 public stations, distributing electric currents to all sections of the city, furnishing thousands of lights and power to dwellings, churches and other classes of buildings. The electric motors in use are of a capacity ranging from ⅛ to 30 horse-power, and are being rapidly introduced as a more ready motor in place of steam and hydraulic power in propelling machinery.

All of the different systems of electric lighting invented are or have been given every opportunity to operate their respective apparatus, and, wherever consistent with safety, approvals were given for use in insured buildings. In innumerable instances, where no insurance was held on buildings, when electric lighting was introduced, contractors were required to install the work in accordance with the underwriters' requirements and subject to the approval of the latter's inspector. No insurance loss occurred in any building in the city during the past year from fire where the cause could in any way be attributed to electric wires.

In reference to lessening the danger in the introduction of electric wires and the use and handling of the light appliances, the circular says:

"Experience has proven that no perfect insulation can be maintained with the customary method of installing electric wires, where either the conductors or the covering are exposed to mechanical injury or deterioration from affecting influences that may arise, more especially when wires are concealed in inaccessible places. A like experience with others no doubt suggested the invention and introduction of an interior conduit of insulated material which may be secured to the building, and allowing the wires to be drawn in and laid free in the tubes, thus protecting the conductors from injury, and preventing any outward fire that might occur from any abnormal currents or severing of a wire. This new appliance has been largely used in this city the past year, and where the system has been continuous has proven to be, in our opinion, the best method yet devised for installing electric light wires."

A Right Honorable Electrician of Kentucky.

The current number of *The Appeal*, an Afro-American newspaper, issued simultaneously in Chicago, Louisville, St. Louis and St. Paul, contains a likeness and sketch (written by himself) of D. H. Wilds, the electrician of the Louisville *Courier-Journal* building. In the course of the article he says: "I was reared in Versailles, Woodford County, Ky., and when about eight or nine years old came to Louisville, Ky., where I have since resided. My first experience in earning a livelihood dates back 18 years ago, when I went to work in the *Courier-Journal* office, where I have been employed continually ever since. I have slowly but surely climbed to the right honorable and lucrative position of electrician of the *Courier-Journal* building. I have in my charge 240 incandescent and 14 arc lamps, and handle them with the same ease that a girl would handle her doll baby."

ELECTRIC LIGHT NEWS

—— The capacity of the Water, Light and Power Company, of Superior, Wis., will be doubled.

—— The Gilliland Electrical Works, at Adrian, Mich., will commence the manufacture of dynamos soon.

—— Out of 85 electric light circuits in Jersey City, the storm of last week left only one in working order. The city was in darkness.

—— Charles H. Warner has filed a bond in the sum of $10,000, conditional for the establishment of an electric light plant in South Bend, Wash., within 90 days.

—— The Stroudsburg, Pa., Electric Light Company will extend its service to East Stroudsburg. To accomplish this its capital has been increased from $15,000 to $30,000.

—— The Edison Electric Illuminating Company, of Cincinnati, have recently purchased a large plot of ground, and will erect a five story building. The ground cost over $65,000.

—— The gas company in Oshkosh, Wis., has decided to withdraw from competition with the Electric Light and Power Company in the matter of street lighting. The wards will all be lighted by the latter.

—— The habitual roysterer is opposed on principle to having the electric wires put underground. The telegraph poles are an enormous help to him in getting home at night.—*Somerville, Mass., Journal.*

—— The officers of the Edison Electric Illuminating Company, of Philadelphia, for the ensuing year are these: President, Fred. Prime; vice-president, Samuel B. Huey, and secretary and treasurer, A. V. Sloan.

—— The New Britain, Conn., Electric Light Company, at their adjourned annual meeting, voted to increase their capital stock from $60,000 to $80,000, the present stockholders to get the preference on the new stock.

—— In accordance with a vote of the stockholders of the Rutland, Vt., Electric Light Company, the capital stock of the company has been increased from $50,000 to $100,000. It is divided into 5,000 shares of $20 each.

—— Sealed bids will be received by Jefferson Rainey, mayor of Belleville, Ill., up to Saturday, February 14th, 1891, at noon, for the purpose of lighting the streets of the city of Belleville, during the next fiscal year, with electricity.

—— The Doherty Bros. new foundry, at Lowell, Mass., is lighted by electricity and the machinery operated by a 20 horse-power electric motor. This motor also supplies the forced draft for the melting furnace and operates a 10 ton crane.

—— The directors of the Brookline, Mass., Gas Company have voted to remove their plant to Brighton, Mass., and have authorized an issue of $350,000 first mortgage, five per cent., 30-year bonds, principal and interest payable in gold. Sales of gas show an increase of 12 per cent. Electric light constitutes one-quarter of all sales, and has largely increased during the year.

—— Through a technical error, the electric light franchise of Lebanon, Mo., is invalid. In the meantime the plant has been put in and the progressive city has enjoyed the lights for a month. A new election on the outlay will be held soon, and a dishonest cuss in that town says, "We've got the lights, boys, let's vote the proposition down." That man would rise out of his grave to steal his own tombstone.—*St. Louis Chronicle.*

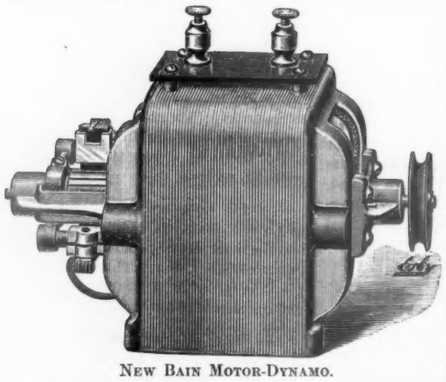
Small High Class Motors.

In the early history of electric light and motor construction, small motors and dynamos did not receive the attention that was given to those larger and then more important sizes; consequently, a great number of inefficient small motors have been put on the market. It requires greater care and more profound knowledge of the science of electrical engineering to design and construct a highly efficient motor or dynamo, say one-eighth horse-power, than is necessary to design and construct one of ten horse-power or larger. The latest candidate for popular

NEW BAIN MOTOR-DYNAMO.

favor in this direction, is the result of the efforts of Mr. Force Bain, of Chicago. The motor-dynamos are manufactured and placed on the market by the Bain Electric Manufacturing Company, 47 and 49 South Jefferson street, Chicago.

In detail the field magnets and armature cores are stamped of the best soft sheet iron; the sheets of the field magnets, in which there are no joints, are then varnished and held together by a stud in each side, this stud also passing through a cast iron guard on either end. This guard answers as a means for making the motor "iron clad" and it also carries the two bearings. The shaft is made of the best Stubbs steel ground true on centers. The armature is Siemens core with Peccinotti projections. The winding is Bain's modification of Fröelich. The commutator is large and solidly made, the brushes being made of a patent material resembling carbon. The advantages claimed for this little motor are: 1st. It is an efficient motor or dynamo, and may be used as either. 2d. There are no joints in the field magnets which are laminated, there is a double magnetic path and the armature runs "end on." 3d. The field coils are placed as



NEW BAIN MOTOR-DYNAMO.

near to the armature as possible; all the lines of force of the field coils are concentrated in the core; there are no radiating magnetic lines of force, and the machine is "iron clad." 4th. Best mechanical construction, the bearings do not require oil or grease or lubricant of any kind, the machine is self-contained, no nuts, bolts or screws to become loosened. 5th. Highest possible efficiency and lowest speed consistent therewith; acme of durability and strength.

Machines of this type are carried in stock from one-twelfth to one horse-power, and they are wound for battery work from two volts to 25 volts, and for 110 volts current and constant current for 6½ and 10 amperes.

The Ongley Electric Register and Signal System.

This most complete and efficient apparatus, described in our last issue, is, in a quiet way, making many friends for itself owing to its reliability and the general satisfaction it is giving. A representative of the ELECTRICAL REVIEW accompanied Mr. C. M. Woolcott, the superintendent of the Ongley Electric Company, to the factory of the F. J. Kaldenberg Company, in East Thirty-third street, this city, where the Ongley system has been in operation for some time.

The registering instrument is placed conveniently in the main office, where it is easy of access and examination. One night-watchman is employed in the building, and he is compelled to turn in his signals while patrolling the building, from 26 stations. These signals are printed on the tape and furnish a perfect record of the time of each visit to each station.

The system includes a fire circuit which may be operated from any one of the 26 stations. A signal of fire notifies the engineer, those in the office, and sets ringing a ten inch gong placed on the outside of the building.

The device for stopping the engine is one of the most interesting and valuable features of the system. The signal was given from one of the stations, the hydraulic valve, which forms a part of the system, was set in motion, and in 20 seconds the 125 horse-power engine came to a dead stop. All this was done with 35 pounds hydraulic pressure on the valve.

When it is known that part of the machinery in this factory is used in turning lathes for making pipes, ivory turning machinery, button machines, shell saws, metal punches, drills, rubber grinding mills and calendar presses, it will be seen that in case of an emergency arising when it would be necessary to quickly stop the engine, the Ongley device is of inestimable value.

The engineer in charge is highly pleased with the Ongley system, and stated to the writer that it had not given him the least trouble. He uses it at noon and night in shutting down his engine from any part of the building he may be in at the time.

Essick Printing Telegraph.

The New England Printing Telegraph Company, operating under the Essick patents, have recently built a line of their own from Providence to Boston. This was done with the expectation of getting permission to erect poles and do business in Boston. They had no doubt about getting such permission, and after they did get it they made preparations to continue the line into the city. They got the poles all ready, took a long term lease of a building in the city to use as offices, and are now ready to complete the line.

Mayor Mathews, however, in a communication to the Board of Aldermen, dated January 26th, uses this language: "Ugly rumors are afloat concerning the methods used to procure the passage of the order granting a location to this company. The president of the Massachusetts company admitted to me that a member of the board of police for the city of Boston was interested in the stock of one company or the other, and it is reported that this gentleman has been active in advocating the cause of the company with members of the present board."

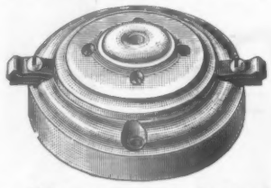
Police Commissioner Osborne, the gentleman hinted at in the Mayor's letter, has come out in an open letter defending himself and denying that anything wrong has been done. He says the company is capitalized at $1,500,000 and that he holds but 25 shares at $50 par value each.

President Dole, of the New England Printing Telegraph Company, says: "I think Mayor Mathews intends to do just what is right and his only idea in this matter is to look out for the best interests of the city." There maybe a controversy over the right of the city to revoke the franchise already given to the company.

The "Spring Clip" Cut-Out.

The Emerson Electric Manufacturing Company, 513 Elm street, St. Louis, are exploiting the cut-out illustrated herewith. They call it the "spring clip" and claim that it cannot rattle loose, and that the contacts are ample and reliable. The design is neat and elegant and we are informed that the price is low.

As will be noticed from the illustrations, the fusing devices and method of fastening on the cover are novel, and in point of convenience would be hard to excel. The fuse wires are simply hooked under the spring



clips, which are conveniently placed on the cover and are of such shape as to hold the fuse until the cap is pressed into the cover, when the spring clips are flattened against the bottom of the base, clamping the fuses firmly and securing perfect contact without danger of breaking or cutting the fuses. The cover is locked into the base by twisting it slightly to the right, where it engages two contact catches. It is easily detached from the base, for the purpose of fusing, by a reverse twist to the left.

No screws are necessary to retain the cover in position, as the tension of the spring clips presses firmly against the contact catches, and by means of a simple provision

it is rendered impossible for it to rattle loose, however severe may be the vibration. The outside line wire clips are of new and convenient design and are calculated to give a large contact surface and great range for different sizes of wire.

The time required to fuse this cut-out is very short; by actual trial over 10 of the spring clip cut-outs have been fused to one of the screw-and-washer kind. No screws have to be loosened and tightened, therefore no screw-driver or other tool is required.

Berlin Iron Bridge Company.

The business of the Berlin Iron Bridge Company, of East Berlin, Conn., has increased so rapidly in the last few years that the stockholders deemed it advisable at the annual meeting, January 19th, to increase the capital stock from $125,000 to $300,000. The entire increase has already been subscribed for by the present stockholders. The additional capital will be used to improve their plant at East Berlin, and the company will immediately put up a new building 80 feet wide by 600 feet long, and expect to have it equipped with machinery and in running order by July.

During the past few years this company have been compelled to run their works day and night during the greater portion of the time, but with their improved facilities they will be able to do 25 per cent. more work than they have been doing and not run their plant over 10 hours per day. They have shipped during the past year 8,000 tons of iron work, consisting of iron bridges, iron buildings and iron roofs. Their sales amounted to nearly $1,000,000, and their work was put up in nearly every State in the Union. The company now have regular established agencies in San Antonio, Tex.; Binghamton, N. Y.; Buffalo, N. Y.; Pittsburgh, Penn.; Raleigh, N.C.; Dayton, Ohio; Enterprise, Miss., and Omaha, Neb.

The prosperity of the company is attested by the great and increasing demand for their work from all parts of the country, and by the fact that the large increase in the capital stock was fully subscribed for by the present stockholders.

Weston Electrical Instrument Factory.

A systematic factory in Newark is that recently equipped by the Weston Electrical Instrument Company, at 116 William street, for the manufacture of the delicate measuring instruments which have spread Professor Weston's name and fame more widely than any other of his numerous and valuable inventions. His voltmeters and ammeters are in every college of importance in the land, and are looked upon as standards by manufacturers of electrical machines and by electric light and power companies. The machines possess great range and are delicate in sense of measurement, without being fragile or easily disarranged. Then, too, they are portable and handsome, but the point which makes them valuable in the hands of unscientific workers in the field of electricity is that they are all "direct-reading," and no mathematical calculations are necessary in connection with them. They are as easy to read as a clock or a steam gauge. The work on some parts of the delicate instrument is as nice as that upon the works of a watch, and the company uses considerable fine machinery made by Sloan & Chase, of Newark, and designed for watch factories. Besides these machines, are many of the Brown & Sharpe Company's most improved tools and several from the shops of Gould & Eberhardt, of Newark. Every tool is the best that money can procure, and nothing is lacking in the equipment of the shop. Fifty hands are employed and more will be added as soon as the equipment is completed. Much of the work, such as magnet winding, is done by young women, who operate the improved winding machines. The tool room of the shop is a marvel of neatness and perfection in system and detail, while the tools, gauges and jigs are as fine as can be made. A great deal of study has been directed by Professor Weston to make the meters as light as possible consistent with strength, and aluminum is employed wherever it can be utilized. Among the new instruments in course of construction is a station ammeter for alternating currents. It is an entirely new instrument, and one of great value to all engaged in operating stations for lighting with this current.

Western Railway Business of the Thomson-Houston Company.

The railway department at the Chicago office of the Thomson-Houston Electric Company reports the sale of an increased equipment to Union Depot Street Railway Company at St. Louis, Mo., consisting of sixteen 30 horse-power double motor trucks and 80 horse-power generators. The power station of the Union Depot Railroad Company, at St. Louis, is perhaps the largest one in the United States, with the exception, possibly, of that of the West End Street Railway Company, at Boston, Mass. The Union Depot power station is equipped with two 500 horse-power, one 300 horse-power and one 150 horse-power Corliss engines, and twenty-six 80 horse-power generators, of the Thomson-Houston manufacture. From this station is operated the Union Depot Street Railroad system, the Mound City lines, and one or two additional lines will also be operated from this same station.

They also report the sale of a 28-car equipment for the Street Railway Company, at Little Rock, Ark. Arrangements have been perfected by which this will be one of the finest and most completely equipped electric street railway plants in the United States. A handsome brick power station will be constructed and equipped with the best Corliss type of engine that can be had. The Thomson-Houston Company intend to make this plant a model one in every respect, and their previous reputation is a safe guarantee that this will be carried out.

The Thomson-Houston Company also report the sale of an extensive electric railway equipment to the Street Railway Company, at Marquette, Mich., and likewise small increases to several other street railway companies in the West.

Superintendent of Telegraph Kinsman, of the Wabash Railroad, reported recently that somebody had stolen from the company "about half a mile of copper wire on a 'live' electric light circuit."

Improved Screw Machine and Turret Lathe.

The screw machine and turret lathe, herewith illustrated, are manufactured by the Garvin Machine Company, New York. They comprise their latest designs in this class of lathes, of which they manufacture a very complete line.

The screw machine is known as their No. 3 size, and is 14-inch swing, 4½ feet bed. It is arranged with power feed and automatic stop. The foot rod and connections are placed on the front of the lathe for convenience in handling. The feed is tripped by means of an adjustable dog, carried on top of the turret slide. The spindle runs in composition boxes, and has a 1½-inch hole its entire length. The outer end of spindle is threaded for chucks, or is made with automatic spring chucks and wire feed. The spring chucks used are of new pattern, which have no end motion when gripping stock.

The turret is 8in. diameter, with eight 1⅛in. holes for tools, and has a movement of 12in. The cross slide is made with rack or screw feed, and with stop for each tool.

The head is made as shown, with back gears or with plain cone, or back gears and friction clutch. The friction clutch head admits of changing instantly from fast to slow speeds, or stopping, as desired. This is particularly valuable when using large

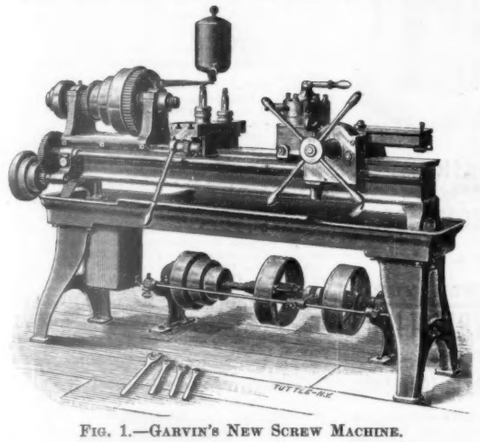


FIG. 1.—GARVIN'S NEW SCREW MACHINE.

dies, or when different parts of the work vary largely in diameter.

This machine is also made with extra large spindle, when desired, which gives a 2⅛in. hole in spindle or 1½in. hole with wire feed and spring chuck. The pan for chips is especially large, and has side extension where chips accumulate, with oil pot at end, where it is not liable to become clogged. The countershaft has self-oiling boxes, with friction pulleys 14in. diameter, 4in. face. The weight of the machine, complete, is 1,600 pounds.

The turret lathe is designed for all classes of work where oil is not required. It is made with the same heads, spindles and turret as the No. 3 screw machine, and with plain chuck, spring chuck or wire feed. It is also made with draw-in chuck operated by hand wheel back of the spindle. It is 16in. swing, and the bed is of open pattern with Vs. The cross slide and turret block are clamped with a hand wheel as shown. The countershaft has friction pulleys 14in. diameter, 4in. face. The weight of this machine, complete, is 1,400 pounds.

Municipal Lighting.

The decision of the Supreme Court of the State in the Peabody electric lighting case was something of a surprise to the people who had expected, after the court's statement to the legislature last Spring, that it would give the right to cities and towns by common law to manufacture gas and electric light for local use, says the Boston *Advertiser*. The court does not go that far, but it has now, by these two declarations, placed the municipal lighting matter on exactly the same basis as municipal water supply stands to-day, viz, that the legislature may authorize cities and towns to embark in the enterprise. In accordance with this situation, several towns either have done so, or are about to petition the legislature to erect lighting plants, issue bonds on them and sell light to their citizens.

Right here the legislature will be met with the question of whether it shall pass a general law, applicable to all municipalities, or in each case as presented decide whether or not the circumstances will warrant giving this authority. Several of our city newspapers have already indicated an opposition to allowing our city government any such authority, though Mayor Mathews directly supported it in his inaugural message. Governor Russell did not go so far, though leaning that way. He is known personally not to favor this idea, although in a measure bound to support it, as it found a formal indorsement in the State platform upon which he was elected. It is safe to say that very large pressure will be brought to bear upon the legislature; not only by those interested in the gas and electric companies doing business in Boston, but by many conservativepeople against allowing our city goverment neither to use such a law to terrorize the local companies or to create such a channel of political patronage and influence as a municipal lighting plant would probably prove under a Democratic city council.

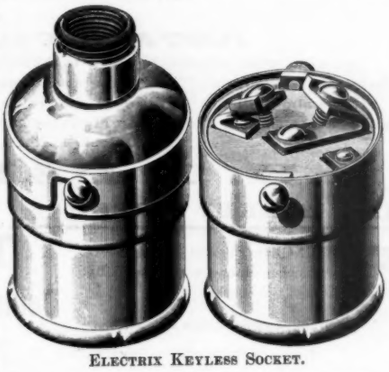
On the other hand, there is a general feeling that in many of the smaller cities and larger towns, which either do not have electric and gas lighting facilities, or if they do, pay largely for very ordinary service, such municipal plants could be run to thebenefit of the community and be honestly conducted. Such places, if they ask the legislature for permission, will be likely to obtain it, especially as the opponents of the idea say that a fair trial of it in a few places would furnish the best argument against allowing the practice to become general. They think that no matter how poor the service or high the price that such places pay now, they would find no improvement under a system of municipal control. They may well remember that in some of the towns it is not solely followers of Bellamy who wish to try municipal lighting, but hard headed business men who have given the subject careful thought.

The bill which passed the lower branch of the last legislature and was smothered in the Senate, provided for the purchase of existing plants on a fair cash valuation. Some opposition will be shown to the adoption of this principle in individual cases. Towns ask why they should be obliged to buy private business risks, and think that if municipal lighting is to be so expensive and wasteful as its opponents claim, the present companies can easily compete with the new system. And even if this is not so, they say that nomoralobligation exists for the purchase of existing plants. For all this, in towns where they exist now, some provision may be made for their acquisition by the public, especially as the tendency of public ownership would be to restrict the field of present corporations. At first it was proposed that towns and cities should only be allowed to manufacture light forpublic use, but if the new departure is begun it will, in practically every case, include the selling of light to citizens for home and commercial purposes.

The way in which the first steps are taken in this matter will have much to do with the growth of the idea in our State, and the present indications are strongly that no general law will be passed, but that the individual communities will present their petitions, enough granted to give a fair trial to a plan which, if it can anywhere be worked successfully, will find its best opportunity in the large towns of this State, with their crowded but intelligent population.

A New Keyless Socket.

We illustrate herewith a new keyless socket, the "Electrix" which is just being brought out by the Star Electrix Company, of Philadelphia. This socket is made to fit any lamp and contains nothing in its make-up but porcelain and brass. It is easily wired and considered very neat in appearance. This enterprising firm continue to add new



ELECTRIX KEYLESS SOCKET.

things every few weeks and already have quite a complete line of electric lighting supplies, such as 5 ampere and 10 ampere single pole switches, 25 ampere double pole switches, key and keyless sockets, insulating joints, gas attachments, ceiling cut-outs and branch and main cut-outs.

Tropical American Telephone Company.

The Tropical American Telephone Company are receiving letters from numbers of their old customers, to whom samples of the new Tropical American Telephone Company's export sets have been sent for trial, all stating that they are much pleased with the new telephone sets and not only commending the reduced price, but also the new 'phone and transmitter, in both of which some important improvements have been made. The testimony is universal that they give perfect satisfaction and the new magneto bells also receive many compliments. Orders are being received from Japan, India, Australia and Africa, as well as increased demand from old territory in Central and South America, Mexico and West Indies. The Tropical Company has already obliged the Boston Fire Department and Paine's Furniture Company to surrender and discontinue further use of the "Hyne's" or "Williams'" drop, and many others now using their drops may expect notice to quit.

Pennsylvania Traction Progress.

An electric railway line is projected to run from Dawson, Penn., to Juniata, a new coke town near Connellsville, Pa., taking in the towns of Vanderbilt and Liberty. James Cochran, the millionaire coke operator, and Col. A. J. Hill, a wealthy citizen of Dawson,

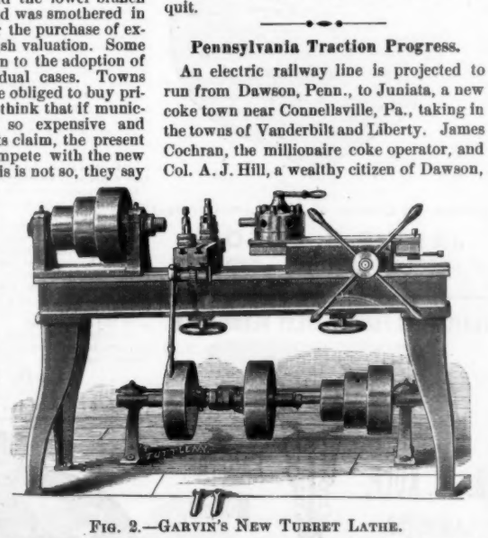


FIG. 2.—GARVIN'S NEW TURRET LATHE.

are the head of the movement. The capital stock of the company will be about $200,000, and Messrs. Hill and Cochran head the list of subscriptions with $50,000. The line will be the largest yet built in the coke regions. It is also reported that Connellsville and New Haven capitalists will erect a motor line to connect those towns next spring. The stock will be about $100,000.

ELECTRIC CLUBS.

New York Electric Club.

The important fact is communicated to us from Bridgeport, Conn., that the large fire bell which has done service in that city for the past 17 years, was cracked while the alarm of fire was being sounded when T. B. Doolittle's barn was burned a short time ago.

Franklin Electrical Society.

This is a Society recently organized by a number of young men interested in electrical science. A number of interesting papers have already been heard, and several discussions of valuable subjects held. Rooms have been taken at 239 to 241 East Fifty-seventh street, this city, where meetings will be held on the second and fourth Fridays of each month.

Massachusetts Electrical Engineers' and Mechanics' Association.

At the last Meeting of the Massachusetts Electrical Engineers' and Mechanics' Association, held in Boston, the following gentlemen were elected to honorary membership: C. L. Edgar, William H. Atkins and William A. Hill, of the Edison Electric Illuminating Company, and Sidney B. Paine, William H. Francis and A. R. Bush, of the Edison General Electric Company.

Wisconsin Electric Club.

The Club at its regular session, January 22d, listened to a lecture by Prof. W. S. Johnson, on the subject of heat regulation. The history of the art was briefly touched upon. The noted French electrician, Dumoncel, was given the credit of having invented the first electrical device for controling temperature. After the lecture, the members of the Club were invited to the engine room of the Loan and Trust building, where the air compressor and other automatic parts of the apparatus are situated. Every part of the heat regulation of the entire building was shown to be automatic. An interesting part of the exhibition was the testing of the alarm device by which the engineer is notified of any error in the working of the system. One of the members of the Club went into one of the rooms and tampered with the thermostat. Instantly a loud alarm was sounded, and the engineer at once located the meddlesome intruder.

West End Street Railway Company.

The West End Street Railway Company, of Boston, were given a hearing by the Massachusetts railroad commissioners, January 20th, on a petition for authority to increase the capital stock. Prentiss Cummings appeared for the petitioner, and Moorfield Storey for certain remonstrants among the stockholders.

Mr. Cummings said that the last increase of stock has been principally used to retire the floating debt. An elaborate detailed statement was submitted, showing how this money had been spent, and an hour of cross-examination of various officials of the road was used upon this statement.

The items in this statement were as follows:

Track construction	$138,333.97
Difference in value of new tracks over old	418,808.25
Cars and motors	1,303,175.64
Equipment	64,064.45
Electric construction	1,890,380.56
Additions since Sept. 30th, 1890	321,141.18
Decrease, real estate and horses	136,938.71
Total to Nov. 30th, 1890	$3,998,865.34

The statement in addition showed that there is $2,000,000 of stock yet to be issued, but that the increase in property, for which there is a floating debt, is such that if this amount were issued and the floating debt taken up there would be but $128,310.43 unexpended.

The new construction, for which new capital is required, is as follows:

Central power station	$1,200,000
East Cambridge power station	650,000
Line construction and equipment	500,000
Track reconstruction	500,000
New car houses	250,000
Electric cars	2,400,000
Total	$5,500,000

The balance sheet of the company, also submitted to the commissioners, is of date of November 30th, 1890, and shows:

ASSETS.

Total fixed property account	$15,805,689
Other assets	1,435,571
Total	$17,241,261

LIABILITIES.

Capital stock	$9,900,000
Coupon bonds	3,250,000
Mortgage notes	784,000
Floating debt (notes payable, $2,005,748)	2,952,530
Total	$16,886,530
Surplus	354,730

KINDRED INTERESTS

The Complete Electrical Construction Company, 24 Cortlandt street, New York, is installing a 350 light incandescent plant in the Philadelphia Club's house, at Long Branch, N. J. A 40 horse-power boiler and 35 horse-power engine will be used.

The Western Electric Company, Chicago, is issuing its 1891 catalogue of hotel annunciators, bells, pushes, and other house goods. It is a handsome pamphlet of 112 pages, is well and profusely illustrated, appropriately bound, and the reading matter is brief and to the point.

The Edison Manufacturing Company, Orange, N. J., are sending out a most complete and excellent catalogue, describing the Edison-Lalande battery. It is folio size and profusely illustrated. The testimonials alone should result in producing large sales of this splendid battery.

The Energy Manufacturing Co., 1115 to 1123 South Fifteenth street, Philadelphia, are sending out a new catalogue of their patent hoisting devices and other mechanical specialties. The illustrations and descriptive matter lead one to decide that these devices are simple and effective.

J. Jones & Son, formerly connected with Pearce and Jones, inform us that they have bought out the entire plant of the late firm of Chapin and Thompson, at 602 and 604 West Twenty-second street, New York, and that they will carry on a general electrical manufacturing business at this address. Messrs. James Jones and James Jones, Jr., are both gentlemen of wide experience in their line of business, and with the well-wishes of their many friends, among whom the ELECTRICAL REVIEW counts itself, will doubtless win complete success.

The Electrical Commissioners of the District of Columbia invite communications from firms interested in electric cables, conduits, subways, etc. Also upon the subject of municipal electric lighting, electric transmission of power, etc. Communications received until March 1, 1891. Personal interviews cannot be granted at present.

Address, ELECTRICAL COMMISSION,
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I am prepared to negotiate for a few desirable patents on Telephones and Telephone Apparatus. Send copy of patent, with terms.

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Dealers in New and Second-Hand
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NATIONAL ELECTRIC LIGHT ASSOCIATION.
Providence, February 17th to 19th, 1891.

The Convention of this Association will be held in Providence, R. I., February 17th to 19th, for which occasion the Michigan Central—"The Niagara Falls Route"—will make a rate of one fare and one-third for the round trip, on the certificate plan, *i. e.*, you pay twenty-two dollars Chicago to Providence, and receive a certificate which will enable you to purchase a return ticket at seven dollars and thirty-five cents.

The cost of Sleeping-car berth each way will be five dollars and a half, between Chicago and Worcester.

These rates will apply to delegates, members of their families, or friends who desire to accompany them.

The Chicago delegation, after a careful consideration of the advantages offered by the various lines, has selected the Michigan Central, and will start from Chicago on their North Shore Limited Express, leaving at 12:20 noon, Sunday, February 15th, which train is due to arrive in Providence at 7:35 o'clock the next afternoon.

The service on this train is unsurpassed, it being a solid vestibule train equipped with buffet, library, dining and sleeping cars, and in fact every convenience that the most exacting traveler could wish, thus insuring a most enjoyable trip

Delegates from Western Cities are cordially invited to come to Chicago to join the Chicago Delegation.

Certificates to enable you to secure the reduced rates will be sent to you upon application to the undersigned.

While the committee are very anxious to have al Western delegates join them and go on this train, it might be well to state that the tickets at this rate will also be accepted on the Fast Atlantic Express of the Michigan Central, which makes through connection *via* the New York Central & Hudson River, Boston & Albany, and New York, Providence and Boston Railroads, arriving in Providence at 11:25 A. M. the second day.

In ordering sleeping car accommodations, state the number of persons in your party and number of berths desired.

Address,
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Pass. and Ticket Agent Michigan Cent. R. R.
67 Clark St., CHICAGO, ILL.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON JANUARY 27, 1891.

445,161 Automatic time stamp; Henry A. Chase, Boston, Mass.

445,176 Electric arc lamp; Joel A. Hayes, Carson City, Nev.

445,207 Electro-magnetic motor; Nikola Tesla, New York, N. Y., assignor to the Tesla Electric Co., same place.

445,217 Thermal cut-out; Albert Barrett, Kansas City, Mo.

445,220 Coin-controlled electric coil; Edward J. Colby, Chicago, Ill.

445,234 Electric cable; John C. Reilly, Brooklyn, N. Y.

445,253 Electric cut-out; John S. Potter, Newton, Mass.

445,295 Electric bell; John F. Wollensak, Chicago, Ill.

445,306 Circuit controller and alarm; Chas. M. Woolcott and Albert E. Wilmot, New York, N. Y., assignors to Thos. W. Robertson and Chas. E. Ongley, both of same place.

445,308 Motor truck for cars; John A. Brill, Philadelphia, Pa.

445,310 Electric switch; Geo. Cutter and Chas. G. Armstrong, Chicago, Ill.

445,341 Electric guest call; Alexander Striemer, Sleepy Eye, Minn.

445,362 Cut-out. 445,363 Electric cut-out. 445,364 Key for electric cut-outs. 445,365 Electric cable connector; Sigmund Bergmann, New York, N. Y.

445,374 Manufacture of carbon filaments; Wm. M. B. Keen and William F. Haarmann, New York, N. Y., assignors of one-fourth to Egbert Le Fevre, same place.

445,409 Turn-out for electric railways; Rudolph M. Hunter, Philadelphia, Pa., assignor, by mesne assignments, to the Thomson-Houston Electric Co., Boston, Mass.

445,422 Secondary battery; Chas. F. Brush, Cleveland, O., assignor to the Brush Electric Co., same place.

445,425 Galvanic battery; Walter A. Crowdus, Memphis, Tenn., assignor to J. W. Allison, trustee, same place.

445,442 Telegraph key; John Doggett, Plain City, O.

445,448 Regulator for dynamo-electric machines; John H. Holmes, New-Castle-on-Tyne, England.

445,475 Telephone; Eloy Noriega, Mexico, Mex.

445,479 Electric connection for track wiring; Sidney H. Short, Cleveland, O., assignor to the Short Electric Railway Co., same place.

445,499 Electric motor; William M. Dresskell, Brainerd, Minn.

445,515 Conductor switch for electric railways; Frank J. Sprague and Johan F. S. Brauth, New York, N. Y.

445,521 Commutator brush holder for electric motors; Geo. H. Condict, Philadelphia, Pa., assignor to the Electric Car Co. of America, of Pennsylvania.

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STANDARD
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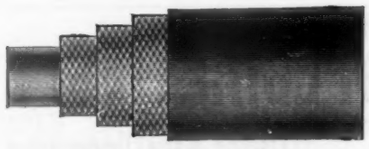
F. S. PEARSON,
Chief Engineer Steam and Elect. Dept.



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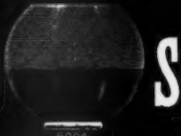
GLOBES  **SHADES**

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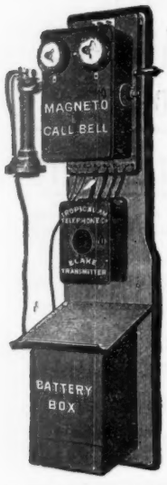

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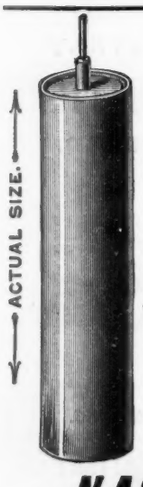

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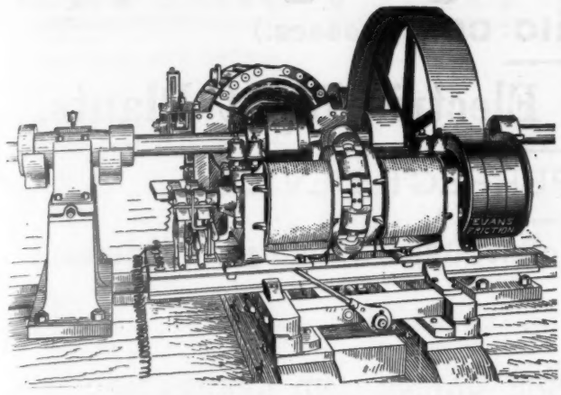

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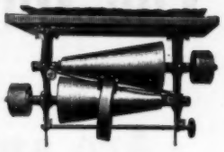

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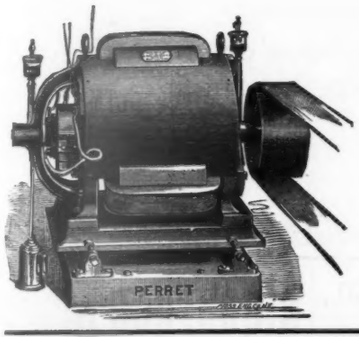

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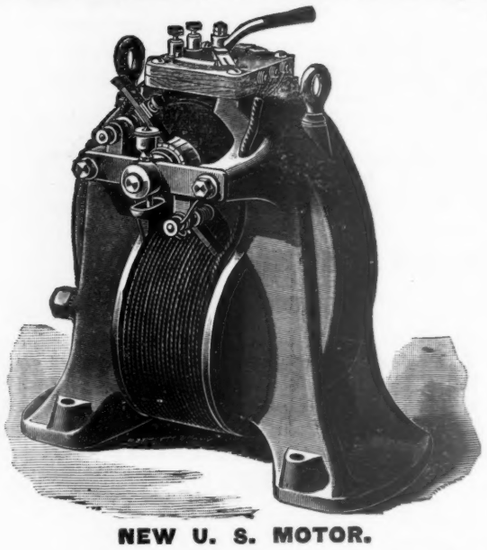

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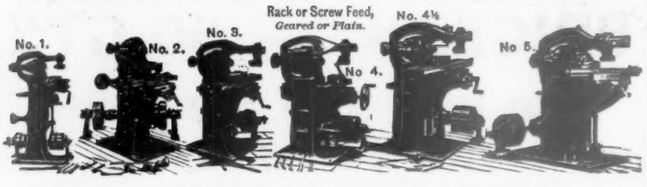

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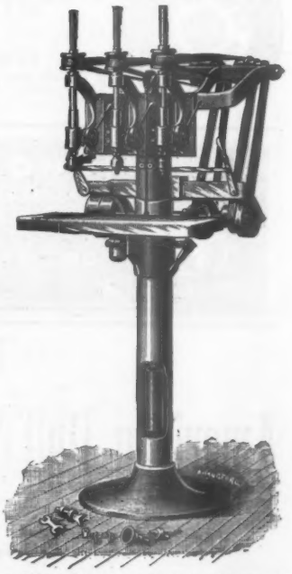

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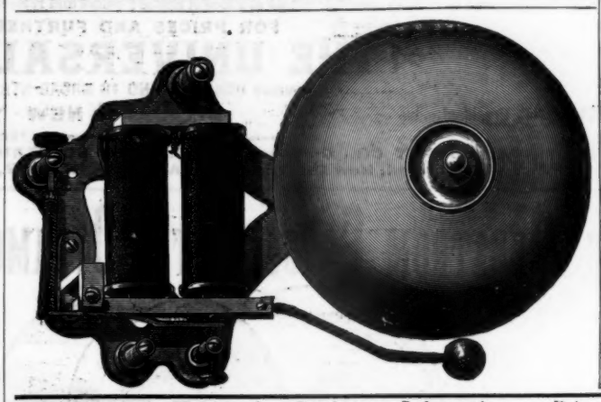

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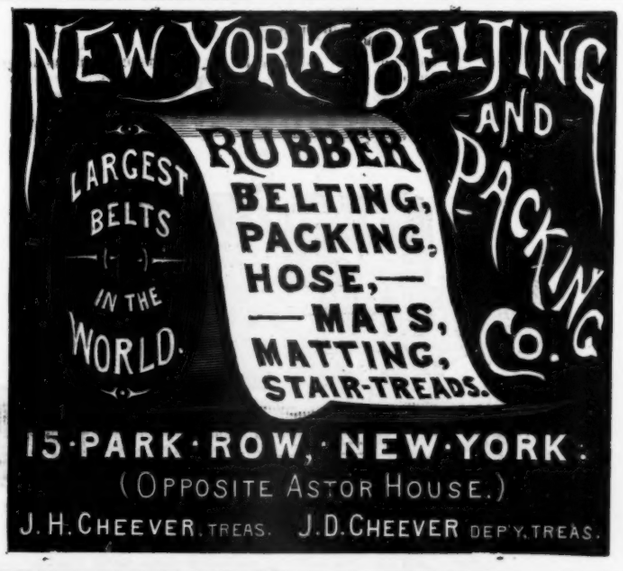
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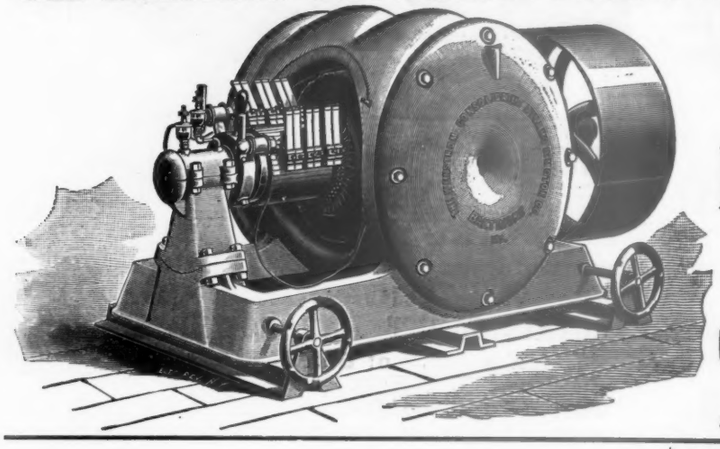

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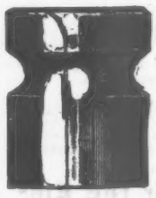

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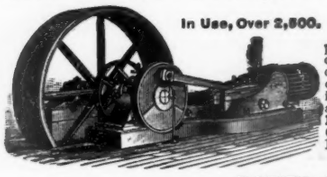

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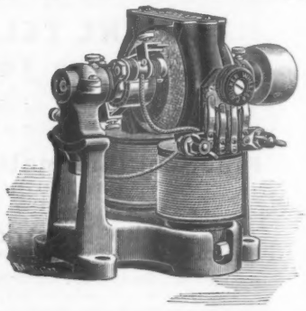

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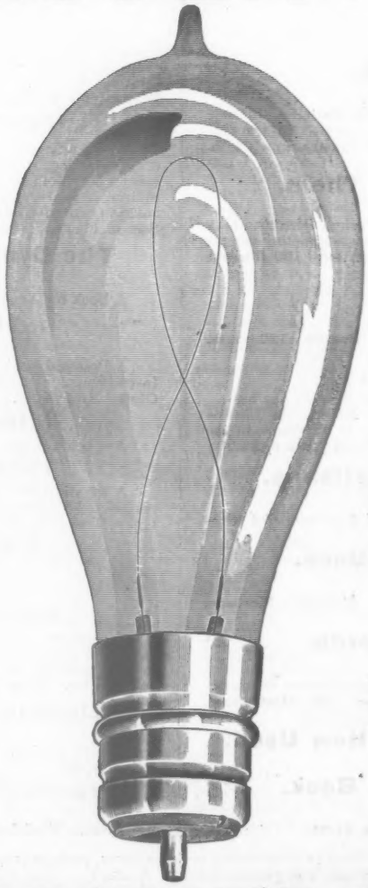

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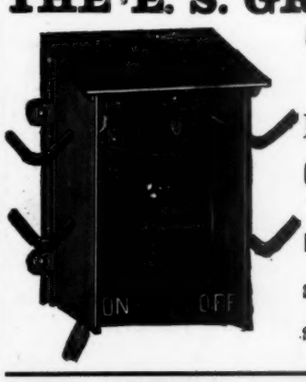

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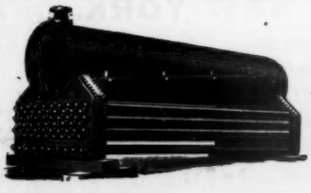

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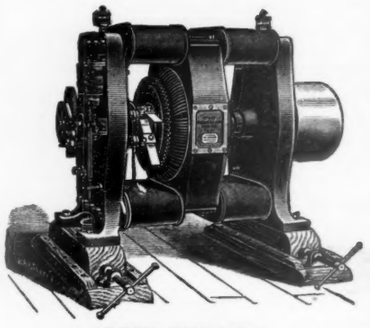

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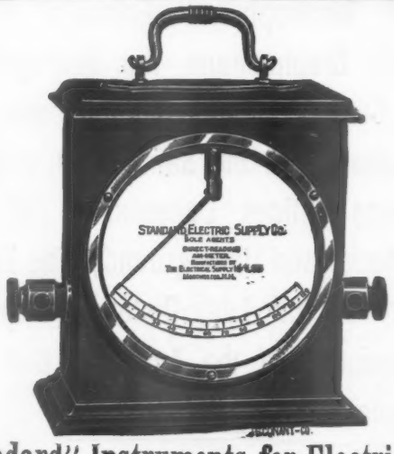

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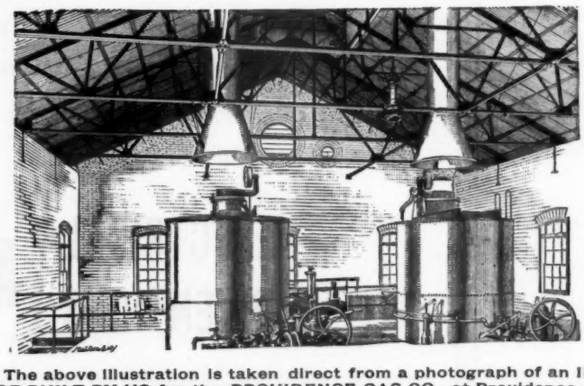

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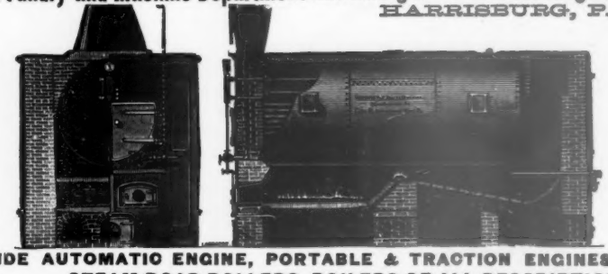

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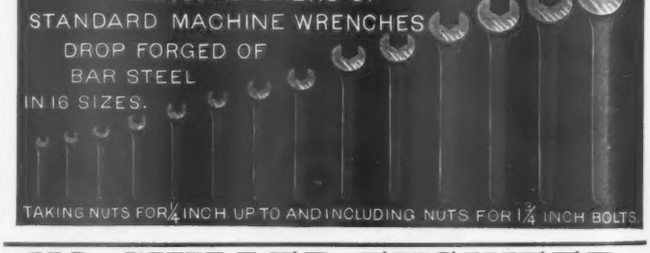
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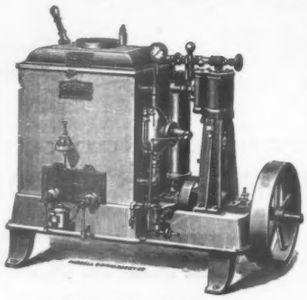

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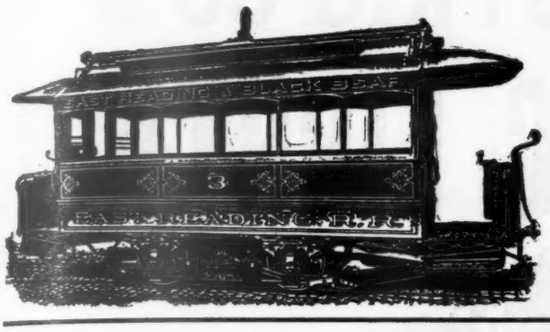

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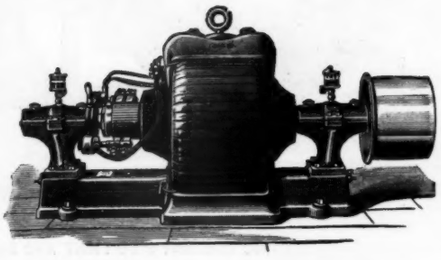

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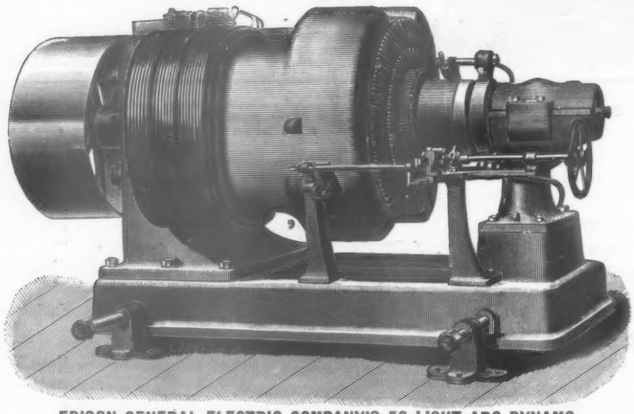

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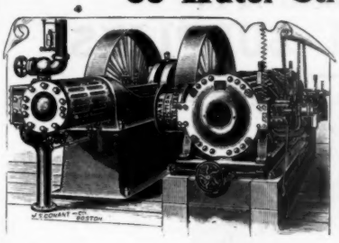

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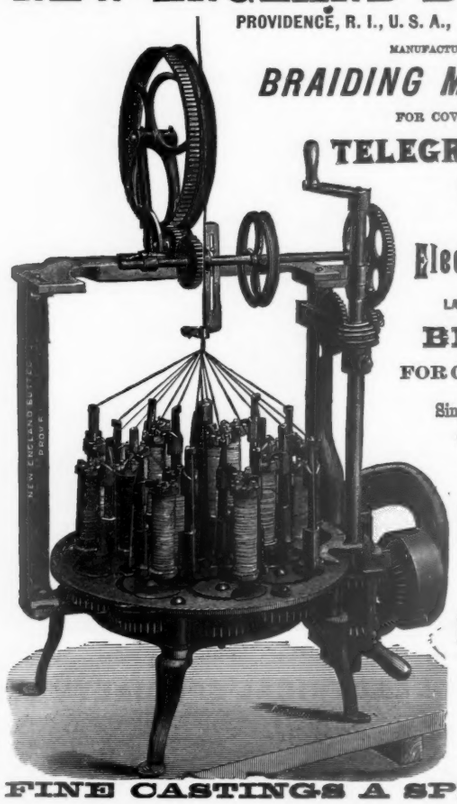

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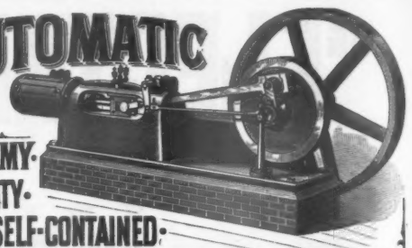

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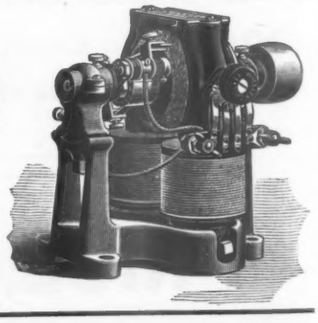

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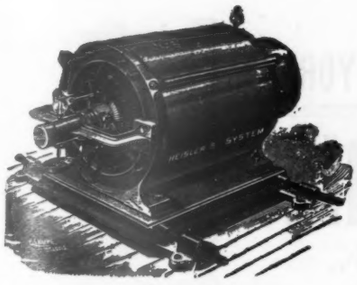

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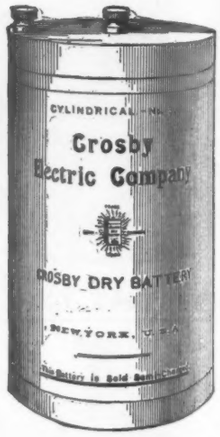

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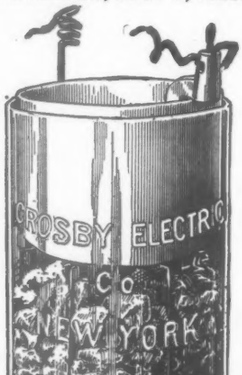

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